

THE FAUCIAL TONSIL
ITS RELATION TO FOCAL INFECTION WITH
PARTICULAR REFERENCE to CHOLECYSTITIS.

THESIS presented for the DEGREE of
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I N T R O D U C T I O N .

That a nidus of infection, localised and perhaps limited in area, may act as the immediate if not the sole, etiological factor in a general systemic disorder, is a pathological thesis that has been accepted as proven long before clinical medicine had formulated any very clear conception of the methods by which pathogenic micro-organisms produce their specific effects. In the present day conception of the term "FOCAL SEPSIS" one includes occult areas of bacterial activity in unexpected and unsuspected situations -- often in deeply placed organs inaccessible to ordinary methods of clinical observation.

To **WILLIAM HUNTER**⁽¹⁾ the world is indebted, to an extent which cannot be estimated, for having first demonstrated in 1900, the important connection between oral sepsis and systemic diseases. In his various contributions to medical literature he has fully established the important connection between oral sepsis and systemic diseases. ⁽²⁾ **MOYNIHAN** referring to **HUNTER'S** work says "Of the truth of his teaching there is not the slightest doubt. Thanks to him we now recognise the grave importance, the casual significance of small and often concealed areas/

areas of septic infection in the tonsils, the pharynx the nasal sinuses and other organs. We are now learning the full truth of his work".

(3) ^a
FRANK BILLING in paper on focal sepsis points how in his opinion focal infection is very frequently related to local and general disease. The focus of infection may be situated anywhere in the body. The following are the common sites:-

1. Faucial Tonsils - peritonsillar fossae and peritonsillar tissues including the lymphoid tissue in pharynx and naso-pharynx.
2. Abscess of gums and alveolar sockets - Pyorrhoea etc.
3. Air sinuses about the head.
4. Bronchiectatic and pulmonary cavities.
5. Chronic ulceration of the bowel - especially in the large intestine.
6. Chronic appendicitis.
7. Cholecystitis and Cholelengitis with or without calculi.
8. Urinary tract. Particularly pelvis of the kidney.
9. Genital tract. Seminal vesicles and prostate. Fallopian tubes and uterus are less common. Parametrium being a more common source.
10. Localised subcutaneous and sub-mucous foci anywhere in the body, may be the source of systemic disease.

The following are described by BILLING

as/

as the common results of focal-infection:-

1. Chronic arthritis - the most common sequel.
2. Nephritis - both acute and chronic.
3. Cardio-vascular degeneration.
4. Chronic neuritis and myalgias (fibrositis).

In support of his views mentioned above BILLING described in a paper (Arch: of Int: Medicine 1912.IX.) his experimental work. In all his cases he carefully searched for foci of infection and removed them. Cultures of bacteria were attempted from these foci and animal experiments were carried out by intravenous injections of pure cultures. More than 30 cases were investigated where Tonsils were responsible for the disease of the joints and kidneys. Also in 3 cases of Nephritis the strains of Streptococcus obtained from the Tonsils of these patients, when injected into animals produced albuminuria. Discussing the wider application of the etiological importance of focal-infection ⁽⁴⁾ BILLING writes:-

"To the now well known relation of focal infection as a chief factor in the etiology of acute rheumatism, chronic deforming arthritis, gonorrhoeal arthritis, malignant endocarditis, myositis, myocarditis, septicaemias of various bacterial types, tuberculosis, nephritis/

nephritis, visceral degenerations, we may add certain important types of thyroiditis with or without hyperthyroidism, pancreatitis acute and chronic with or without resulting glycosuria, septic and duodenal ulcers and cholecystitis. With the defences of the body diminished by over-work, exposure to cold, dissipation, insufficient or improper food, unhygienic surroundings, injuries from former disease, the individual may suffer from acute rheumatic fever, chronic arthritis, myositis, chronic infective endocarditis, pneumonia, ulcers of the stomach, cholecystitis respectively depending on the phase of mutation in pathogenicity affinity of the streptococcus-pneumococcus group in the focus of infection"

Thus the most striking feature of these small, hidden and chronic foci of infection is the selective action on the different systems of the body of the micro-organisms concerned, the predominating one being the streptococcus.

(5)
E.C. ROSENOW (Chicago) in his monumental work (1914-1916) showed the extraordinary elective affinity in the action of the different strains of streptococci isolated from the mouth and Tonsils of the patients suffering from particular diseases.

✓In/

In a paper entitled "Elective localisation of Streptococci" he has conclusively shown the extraordinary affinity of different strains of Streptococcus to the particular organ from where it is obtained. By intra-venous injections into animals (rabbits) **ROSENOW** was able to produce, in a very large proportion of cases, similar disease in the animals. Thus 14 strains from cases of appendicitis produced lesions in the appendix in 68% of the 68 rabbits injected, which was in marked contrast to an average of only 5% of lesions in the appendix in the animals injected with strains of streptococcus obtained from sources other than appendix. Further 18 strains from ulcers of the Stomach and Duodenum produced haemorrhages in 60% and ulcers of Stomach and Duodenum in 60%, a combined total of 74% of the 103 animals injected in contrast to an average of 20% haemorrhages and 9% of ulcers following injections of other strains. 12 strains from cases of Gall-bladder disease he was able to produce lesions in the Gall-bladder of the rabbits in 80% of the 41 animals injected in contrast to an average of only 11% with strains obtained from other sources.

While incidence of lesions in the organs
✓ following/

following injections of the strains isolated from such organs is high, as shown by the above mentioned figures, the appearance at necropsy were even more significant. In many instances in which the animal survived the injection for some time, no other focal lesions could be found, except those in the organs in question: and when the animals died early these lesions were the marked feature and the associated ones were relatively insignificant. Frequently the injection of a very small dose was sufficient to prove the elective localisation. In **ROSENOW'S** experience this elective property was shown, not only by the cultures from tissues and foci, but also by the bacteria contained in the foci, directly injected in other animals.

Following this work **A.L. WILKIE** ⁽⁶⁷⁾ of Montreal, working in the department of surgery of the Edinburgh University produced some extraordinary results in animals (rabbits) by injecting live cultures of streptococci, obtained from the cystic gland as well as the Gall-bladder wall itself. The material was obtained from cases of acute and chronic cholecystitis. His work threw great light on the pathology of the Gall-bladder and showed how the infection/

infection reached that organ by the blood stream. He once more affirmed the theory of elective localisation that was established by ROSENOW. He obtained non-haemolytic streptococci from the cystic gland in 86% of the cases examined. In animals positive results were obtained in every case after intravenous injections of the organisms obtained from the cystic gland.

This work opened new lines of investigation and research. If the cases of Gall-bladder disease are the result of infection elsewhere in the body then it should be the duty of the physician and the surgeon to find out the focus of infection and remove it before dealing with the Gall-bladder itself. Further as a preventive measure, it would be equally important to deal with the most likely avenues of infection early enough to avoid the production of Gall-bladder disease.

In a discussion on A.L. WILKIE'S work, in the Medico-Surgical Society of Edinburgh, PROFESSOR (6) WILKIE asked three very important questions.

- i. "Where does the infection come from in the human-being? Is it the tonsil, teeth, or the bowel"?
- ii. "Can the vaccines be employed against the organism"?
- iii. "What is the importance of Gall-bladder as a focus of infection"?

The/

The present investigation, and that carried out by Dr. R.B. LUMSDEN⁽⁸⁾ was carried out in order to reply to only a part of PROFESSOR WILKIE'S first question. That is, to see if the faucial tonsils act as a focus of infection in cases of acute or chronic cholecystitis. It was postulated that if the tonsils were harbouring the specific streptococci which had predilection for the gall-bladder^d and were from time to time getting into the general circulation and subsequently producing pathological changes in the gall-bladder then by getting at the parenchyma of the tonsil one could obtain the responsible organism, grow them under suitable conditions and see whether they produce any changes in the animals when injected intra-venously. LUMSDEN⁽⁸⁾ started this work and after a considerable difficulty was able to evolve a technique by which he could get at the micro-flora of the parenchyma and the deeper parts of the crypts, of the extirpated tonsils. In a paper⁽⁸⁾ which LUMSDEN read before the Scottish Society of Otology and Laryngology, he described this technique and showed that he was able to obtain a non-haemolytic streptococcus in 18 out of 23 cases that he had investigated up-to-date. Since A.L. WILKIE got pure cultures of non-haemolytic streptococcus in 43 out of 50 cystic lymph glands obtained from/

from cases of gall-bladder disease, it was considered sufficient to confine entirely to the non-haemolytic streptococcus. He, therefore, obtained pure cultures of the non-haemolytic strptococcus and carried out his animal experiments by intra-venous injections. The results of his investigation are not available yet.

In April '29 PROFESSOR D.P.D. WILKIE suggested this work to me. In the earlier part of my work I followed LUMSDEN'S technique but on account of several important reasons definite alterations had to be made. It was noticed that, with the exception of a very small number of cases in which definite evidence was available regarding the diseased state of the patient's gall-bladder, for example where the gall-stones had been removed or where there was history of gall-stone colic accompanied by jaundice, there was no means of making a definite diagnosis of gall-bladder disease. It was impossible to make any clinical investigation as in most cases the patients were not prepared to undergo any laboratory investigation. So that in the Ear, Nose and Throat Department of the R.I.E. in a majority of cases one had to entirely depend on the clinical history given by the patient. This was very unsatisfactory/

unsatisfactory as in most of the hospital class of patients their own statements, which were often vague and uncertain, could not be depended upon. Further it was noticed that most of the cases that were sent for tonsillectomy had no history of any abdominal condition at all leaving aside the gall-bladder disease. It was, therefore, necessary that cases of definite cholecystitis should be investigated and the organisms from their tonsils obtained.

There was no difficulty in getting cases of cholecystitis in PROFESSOR WILKIE'S wards, but it was difficult to even suggest tonsillectomy to the patients after the major operation to which they were subjected. Besides most of the cases of chronic cholecystitis gave no history of any throat trouble. It was therefore absolutely imperative to devise a method of getting at the micro-flora of the parenchyma of the tonsil without subjecting the patient to tonsillectomy. This was evolved and carried out in the latter part of my work. Definite cases of chronic cholecystitis were thus studied.

ARRANGEMENT OF THE THESIS.

PART I. I have attempted to collect some information regarding the anatomy, comparative anatomy and the much discussed problem of the physiology of the tonsils.

- (b) Fifty extirpated tonsils were examined microscopically and an attempt made to summarise the pathology of chronic tonsillitis to explain how the tonsil may act as a focus of infection.
- (c) Bacteriology of the tonsils has been worked out. Notes are added regarding the classification of streptococci and the various tests employed in the present investigation. Charts containing complete data of 110 tonsils examined are added. Technique employed for the examination of tonsils is also described in detail.
- (d) Experiments with animals are also given. The lesions produced are tabulated.

PART II. I have described the new method of "Tonsil Puncture". This part also contains the chart showing the bacteriology of tonsil-puncture as applied to 14 cases of cholecystitis.

- (b) Animal experiments with organisms obtained by tonsil puncture are also added to this part.

PART III./

PART III. "Tonsil injection with streptococci". Direct tonsil injection in two dogs was carried out in order to see whether repeated attacks of tonsillitis, caused by a strain of streptococcus obtained from the wall of the gall-bladder or the cystic lymph gland of a case of chronic cholecystitis, produces any disease of the gall-bladder in these animals.

PART IV. A set of experiments on three series of animals (rabbits) were carried out where in addition to the organisms a second factor of "lowered resistance" was also introduced. Streptococci were obtained from various sources, e.g. from extirpated gall-bladder or cystic lymph gland, by tonsil puncture in a case of chronic cholecystitis, from an extirpated tonsil of a case where the patient had no abdominal disorder. The animals were opened up and their gall-bladder and lesser curvature of the stomach ~~was~~ traumatised. The object of this series was to see:-

(i) Whether lowering of resistance of a particular organ alone determines the localisation of any particular organisms.

(ii) Whether any particular organisms show a greater tendency to localisation in one organ more than the other, the two organs being under similar conditions.

PART V./

PART V. Contains a short description of the lesions produced in the animals by streptococcal injection during the course of this work.

(b) A general discussion and summary is added at the end.

APPENDIX. The clinical histories, and other experimental details of all the cases studied are put in the appendix in order to avoid confusion.

Some of the naked-eye specimens have been reproduced in water colours. All of them were drawn and painted by the author himself. Several photographs have been added to illustrate statements made in the text.

PART I.

FAUCIAL TONSILS.

To discuss the role of Faucial Tonsils in cases of cholecystitis, it is essential to briefly describe their gross and minute anatomy. Equally important it is to briefly discuss the physiology of these organs, in order to understand their normal function or functions and see how these functions are altered or upset under pathological conditions.

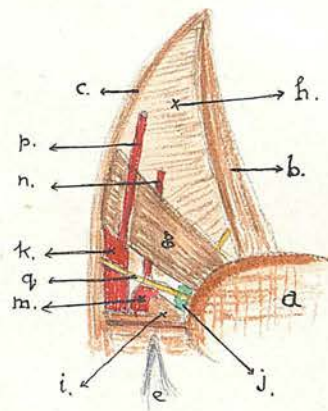
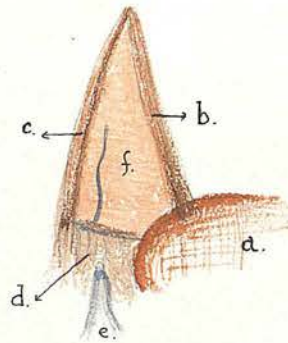
ANATOMY OF THE FAUCIAL TONSILS.

(9)
WALDEYER, in 1884 described what has since been known as **WALDEYER'S** ring. It is the name given to the group of lymphoid tissue situated in the naso-pharynx and the pharynx. It consists of large masses of lymph follicles represented by the **Pharyngeal** tonsils or Adenoids, the Palatine or Faucial Tonsils, the Lingual Tonsil which is situated at the base of the Tongue, and smaller masses such as the **Eustachian Tonsil**. These masses of lymphoid tissue undergo involution at the age of puberty; they are connected together by strands of the same tissue under the mucous-membrane of the pharynx. The lateral tracts are frequently found hypertrophied in adult life, and are then known as the/
the/

the lateral pharyngeal bands.

The Palatine or Faucial Tonsils are the two largest masses of lymphoid tissue which are situated in the side walls of the oral part of the Pharynx, in the lower part of a triangular recess called the Sinus Tonsillaris.

The Sinus Tonsillaris also known as the Tonsillar fossa or the Tonsillar Bed is a triangular space occupied in its lower part, by the Palatine Tonsils. It is bounded anteriorly by the glosso-palatine arch or the anterior pillars of the fauces. These are two prominent folds of mucous-membrane which bound the isthmus of the fauces on either side. Each contains a glosso-palatine muscle in its interior. They are continuous above with the inferior surface of the soft palate, about 8 mm. anterior to its free edge, and the base of the Uvula. From there they pass downwards and slightly forwards to join the side of the tongue a little behind its middle. Posteriorly it is bounded by the pharyngo-palatine arch or the posterior pillars of the fauces. The posterior like the anterior pillar is a fold of mucous membrane containing in its interior the pharyngo-palatine muscle. It springs from the posterior edge of the soft palate and passing downward and slightly backward, ends inferiorly on the side of the pharynx. Thus these pillars meet superiorly/



J.P.D.

Diagram. showing the deep relations of the tonsil.

- | | |
|--------------------------|---|
| a. Tongue. | h. Int. pterygoideus. |
| b. Palatoglossus. | i. Stylohyoideus. |
| c. Palatopharyngeus. | j. Submaxillary Salivary gland. |
| d. Middle constrictor. | k. External Carotid artery. |
| e. Epiglottis. | m. External Maxillary artery. |
| f. Superior constrictor. | n. Tonsillar branch of ext. maxillary artery. |
| g. Styloglossus. | |
| | p. Ascending palatine artery. |
| | q. Lingual nerve. |

superiorly and unite with the soft palate, while inferiorly they separate and blend with the tissues at the base of the tongue and lateral wall of the pharynx. The outer wall or floor of the cavity consists of the superior constrictor muscle of the pharynx, to which the Tonsil is loosely attached by connective tissue. The anterior limit of the cavity often extends well under the anterior pillar and conceals a large portion of the Tonsil. Similarly the upper dome-shaped limit extends into the soft palate and may conceal the upper pole of the Tonsil. Further deep relations are well illustrated in Diagram No. I.

Situated in this Tonsillar Bed is the oval shaped Palatine Tonsil, with its long axis directed vertically. Each tonsil presents a medial and a lateral surface; a superior and an inferior pole; an anterior and a posterior margin.

The medial surface is convex and is exposed in the throat. It is covered by stratified epithelium and is studded with from ten to twenty openings called the crypts. These crypts extend deeply through the structure of the tonsil, as far as the capsule and are lined by a continuation of the/

the surface epithelium.

The lateral surface is enclosed in a fibrous capsule connected with the pharyngo-basilar fascia, and this fascia separates the tonsil from the superior constrictor muscle of the pharynx.

The superior pole is rounded and blunt. The inferior pole projects downwards towards the tongue. The anterior margin looks towards the glosso-palatine arch and is overlapped by plica triangularis. The posterior margin is directed towards the pharyngo-palatine arch.

THE PLICAE.

The free or exposed surface of the tonsil is surrounded by an elliptical fold, with a free margin, termed the "annular plica," which represents the non-embedded portion of the capsule covered with mucous-membrane. The annular plica is not of a uniform width all round the tonsil. In its upper portion, which overlaps the upper pole of the tonsil, it is more marked and semi-lunar in shape, and is referred to as the "plica semi-lunaris or supra tonsillaris". When traction is applied on the tonsil, the plica semi-lunaris comes more prominently into view. In its lower portion it is more prominent, /

prominent, and forms a triangular suspensory sling for the lower pole, and is here referred to as "plica triangularis." In the adult the plica triangularis is really a part of the capsule.

TONSILLAR FOSSAE.

The following spaces beneath the plical folds are frequently referred to as fossae. (MOORE)¹⁰

The Supratonsillar Fossae has unfortunately been confused with the crypta magna which was also given the above name. The true supratonsillar fossae, from its name, must necessarily be outside the tonsil, and is situated between the plica semilunaris and the superior pole of the tonsil. It may consist of a distinct space under the plica semilunaris, if the latter is well developed, or it may be present if the plica is badly developed.

The Anterior Fossa is the space between the anterior surface of the tonsil and the anterior pillar and plica triangularis. Its surfaces are always in apposition, and it may be continuous with the superior fossa, or with the posterior fossa if the annular plica in this position is well developed.

The Posterior Fossa, is found only when

a plica retro-tonsillaris is present ~~is present~~, and may be continuous above with the supratonsillar fossa.

(11)
BARNES says that in cases in which all the plicae are present the combined fossae form a complete moate around the tonsil.

The size of the palatine tonsils is extremely variable, but as a rule, in early life, they measure something under 20 to 22 mm. from above downwards, about 18 to 20 mm. Antero-posteriorly, and 12 to 15 mm. medio-laterally. (12)
 (WATERSTON.)

VESSELS AND NERVES.

The arteries supplying the tonsil are the dorsalis linguae branches of the lingual artery, the ascending palatine and tonsillar branches of the external maxillary, the ascending pharyngeal branch of the external carotid artery, the descending palatine branch of the internal maxillary artery, and a twig from the small meningeal artery.

(13)
 (HOWDEN.)

The veins pass to the tonsillar plexus, on the lateral side of the tonsil, which is an offshoot of the pharyngeal venous plexus.

The/

The nerves. The palatine tonsil receives a special branch from the glosso-pharyngeal; this unites with the branches from the pharyngeal plexus to form a small plexus tonsillaris which supplies the organ.

m LYMPHATIC DRAINAGE OF THE TONSILS.

14

GEORGE BACON WOOD, in a paper on this subject, describes how by a special injecting method he was able to follow the course of lymphatic drainage in man. He injected a dye, Berlin blue, under the mucous membrane covering the tonsil, by a gradual and steady pressure. After that he massaged the tonsil, thus helping to push the dye into the efferent vessels. He did this on several dead bodies and then followed the course of the efferent lymph-vessels.

From the substance of the tonsil, lymph is drained to the surface. They begin in a plexus which surrounds each follicle. Thence they pass into the retro-tonsillar space where they are extremely numerous. They then proceed as one or two or more fine vessels, after having passed through the pharyngeal/

pharyngeal apponeurosis and the superior constrictor of the pharynx, run obliquely in a downwards posterior and outward course, passing below the facial artery. Bending more posteriorly the lymph vessels next run between the internal jugular vein and the styloid muscle, reaching finally to the superior surface of a large lymph gland, placed just beneath the anterior border of the sterno-mastoid muscle, where it is crossed by the posterior belly of the digastric muscle. The efferent vessels from this gland are generally two or three in number. They pass into the neighbouring glands of the internal jugular group. By a single lymph channel the tonsillar lymph finally empties into the jugular lymph trunk. The point of importance in this work was, that none of the superficial set of glands were injected with the dye: thus pointing to the erroneous statements of the text-books of anatomy which state that the tonsil drains into the posterior gland of the submaxillary group. The enlarged gland in the acute tonsillitis is the tonsillar gland, which lies external and slightly anterior to the internal jugular vein, and is embedded in the loose areolar tissue containing more or less fat. Its enlargement consequently means its displacement outwards and forwards, and specially so if the other deeper glands are also enlarged.

DEVELOPMENT OF THE FAUCIAL TONSILS.

The tonsil arises early in the 3rd month of foetal life from that part of the 2nd cleft recess which is left between the soft palate and the tongue. In the 4th month, eight or ten isolated buds of entoderm push out from an elevation, situated in this recess or pocket, and grow into the mesodermal tissue in the wall of the pharynx. ¹⁵ GULLAND describes the ingrowth of the epithelium as the essential feature in the development of the tonsil. He does not explain why the epithelium of the pharynx forms a fold or an epithelial pit. He imagines that this growing epithelium causes fibrous tissue condensation round it, and due to this slight, but steady irritation proliferation of connective tissue cells occurs. This process occurs prior to the appearance of leucocytes. When the leucocytes appear they gather round this epithelial pit for the following reason. The blood-vessels are large and delicate due to permanent vasomotor paresis caused by chronic irritation, thus resulting in chronic vascular dilatation. When this has been established, and leucocytes have begun to pass out in large numbers through/

through the vessel walls, it is more than likely that permanent permeability of the walls results, which renders it thereafter more easy for leucocytes to pass through, even when epithelial growth has been arrested. When once these leucocytes pass into connective tissue they are detained and are found most numerous, where the connective tissue is most condensed, ie. round about the blind extremities of the crypts. Thus follicles of lymphoid tissue begin to collect round the epithelial buds in the 5th month of foetal life.

The recess above the tonsil, sometimes crossed by a fold (the plica semilunaris) is a remnant of the recess of the 2nd cleft in which the tonsil is developed. In many mammals the tonsillar recess assumes the form of a funnel-like process resembling the finger of a glove, the blind end reaching almost to the angle of the jaw. ¹⁶ (KEITH?)

The tonsil is part of a great lymphoid system stationed along the alimentary canal. It reaches its fullest growth in youth, as is the case with lymphoid system generally; when active growth of the system is over, specially in the years of decay, it becomes markedly reduced in size.

COMPARATIVE ANATOMY OF THE TONSILS.

In order to understand the functions of an organ sometimes great information can be obtained if one studies the comparative anatomy of that particular organ. Here I only wish to briefly mention a few facts which I collected from the literature on this subject. G.S. HETT and H.G. BUTTER-
FIELD¹⁷ in an important paper on the anatomy of the tonsils gave the following account which I quote very freely.

Well defined tonsils seem to occur with few exceptions throughout the mammalia, and, as shown below, present a well marked gradation from a simple diverticulum to the tonsil of a higher ape, which approximates closely to that of man.

Tubular Tonsils. The tiger and the leopard have tonsils which form the starting point of the series. In these animals there is a V-shaped opening in the mucousmembrane of the pharynx, leading into laterally compressed blunt-ended tube. The tube is only separated from the buccal cavity by the mucous membrane, through which the outline/

outline can be seen. It is lined by epithelium continuous with that of the pharynx, and this is surrounded by lymphoid tissue.

The lymphoid tissue reaches nearly to the outlet of the tonsillar tube, except at the upper margin, where it falls a little short of it.

In the cat and lynx the tonsil is similar, but lymphoid tissue protrudes from the opening at the lower margin of the outlet.

Pocket-shaped Tonsils. The lemur has a tonsil which is pocket shaped. In many monkeys, such as the marmosets, gibbons and cercopithecus, the tube has become shorter, so that the tonsillar diverticulum is pocket shaped. It is more or less surrounded by lymphoid tissue, but the lower or inner lip of the pocket tends to have a greater deposit of lymphoid tissue than the outer wall.

The pocket-shaped tonsil, with a varying amount of lymphoid tissue on the inner and outer walls is found through a wide range of mammals, including the above monkeys, the opossums, wombat, Tasmanian devil, kangaroo etc.

The hyaena has a tonsil of this form with a prominent rounded lower lip.

Solid Projecting Tonsils. A type of tonsil found in the dog, bear, badger, kinkajon etc.,/

etc., is the solid projecting tonsil. This is an evolution of the last form, as is seen by cutting sections at right angles to the long axis of the tonsil. The lymphoid tissue is then seen to extend for some distance round the recess above the protruding portion.

The bear's tonsil has the protruding portion divided posteriorly by two grooves into three masses.

In the solid tonsil it appears as though the tonsillar sac had opened out, leaving the lymphoid tissue exposed, the tonsil of the mongoose showing a transitional form between this type and the tonsil of the cat, while that of the walrus shows a later stage of the same process.

The seal has a central fossa, but the lymphoid tissue, instead of being disposed in prominent upper and lower lips, as in the case of the walrus, is arranged round the central recess. The tonsillar tissue reaches the surface but does not protrude.

In the ox, goat, and sheep the tonsillar recess is directed outward at right angles to the pharynx, and lymphoid tissue is arranged round it.
In/

In the calf the lymphoid tissue is arranged in three masses round secondary diverticula of the main tube. In the goat there are two such masses, while in the domestic sheep there are also two, but in the wild sheep and the moufflon three masses are found.

In the sheep the openings appear on the surface, owing to proliferation of lymphoid masses in this direction, and to a partial evagination of the diverticulum. It is noteworthy that in several of the monkeys, two tonsillar sacs were found. Apparently these were variations, as they did not occur consistently in the same species, and in one rhesus monkey the condition was unilateral.

A young gorilla (three years old) showed a tonsil indistinguishable from that of a child of the same age. Many of the monkeys showed well marked lingual prolongation.

At first sight it is not easy to correlate solid projecting tonsils of the dog and embedded tonsils of the sheep or seal, with the simple tube of the tiger. If, however, sections of the tonsils and macroscopic specimens be studied together, it is easily seen how they form a series and how the tonsil of man can be regarded as an evolution of the simple/

simple form.

The early foetal condition is represented by the tonsil of the leopard.

The three tonsillar masses of the foetus are seen in certain mammals e.g. bear and ox.

In the first few years of life the deep portion of the tonsil is well developed, so that the normal tonsil is of the embedded type. There is then a considerable amount of lymphoid tissue round the supratonsillar fossa. Later, this tends to diminish, so that the portion of the lymphoid tissue which projects from the outlet then becomes the greater part of the tonsil. Later still, the projecting portion normally atrophies, leaving a flat space between the pillars of the fauces.

HISTOLOGY OF THE FAUCIAL TONSILS.

✓ The faucial tonsils are two masses of lymphoid tissue. On the free surface they are covered with the stratified epithelium of the mucous membrane, which is continuous with the mucous membrane of the mouth and pharynx. This surface is pitted with apertures which lead into recesses or crypts in the substance of the organ. These crypts are lined by prolongations of the surface epithelium, and into them the ducts of small mucous glands open.

The parenchyma of the tonsil consists of lymphocytes, which, in addition to being present throughout, are at intervals aggregated into nodules. In these nodules the lymphocytes are more closely arranged than elsewhere. These nodules are given the name of germ-centres, because it is here that the active multiplication of these cells goes on. Owing to this active multiplication the central zone is seen to be clear. Similar structure also occurs in lymph glands and spleen etc. ¹⁸ (GULLAND.)

The epithelium which covers the tonsils is infiltrated with lymph corpuscles, many of which/

which wander out on to the free surface, and become mingled with the saliva as salivary corpuscles.

¹⁹
(SCHAFER.)

The lymphocytes are held together by means of a fine fibrous tissue reticulum. Under high power the lymphoid follicles show an indistinct capsule due to a closer arrangement of the connective tissue of the pulp, thus forming a space or lymph path. ²⁰ (MOORE.)

TYPES OF TONSILS.

²¹
MOORE in his book describes, what he calls, the two commoner and familiar types:-

(a) The pedunculated tonsil, which may be seen protruding prominently in the throat, and is generally attached by a small base and shallow tonsillar bed.

(b) The buried or embedded tonsil, which may or may not extend beyond the level of the faucial pillars, and is attached by a wide base to a deep tonsillar bed, while its upper pole extends high up under cover of the palatal folds. This kind of tonsil may be highly septic without marked prominence.

PHYSIOLOGY OF THE FAUCIAL TONSILS.

From what has been said before regarding the presence of the tonsils throughout the mammalia, in the chapter on the comparative anatomy of the tonsils. one would hardly think that these structures are there without any important function or functions which they have to perform. The question of the tonsillar function has, in the past, attracted the attention and serious consideration of several authorities. Consequently many theories have been advanced and attempts made to explain satisfactorily this much-discussed problem. The truth lies, as in most of the other much theorised problems, in the fact that these organs perform more than one functions. Here I wish to discuss the following theories:-

(I) Secretory Glands.

The writer of the article "Tonsil" in Quain's dictionary of medicine page 1647 states without any question that the office of that organ is to secrete a lubricating fluid to moisten the fauces and bolus of food to aid in deglutition. This theory is not supported by a consideration of the true histological structure of the tonsils.

(2)/

(2) Absorbent Glands.

22

HINGSTON FOX in 1885, writing on the function of the tonsils, pointed out that these glands belong to the Alimentary tract, and that they are similar in structure and function to other collections of lymphoid tissue in the intestine. (Peyer's patches, solitary follicles and appendix.) As a class these organs have been termed "Follicular lymphatic glands" to distinguish them from "conglobate" or ordinary lymph glands.

HINGSTON FOX imagines that the buccal fluids accumulate in the crypts, pass through the mucous-membrane, and are thus absorbed, helping thereby to prevent fluid waste in the economy, especially during the time when small quantities of salivary secretion are present and there is no deglutition. During deglutition, he maintains that they absorb certain of the elements of the food bolus as it is squeezed passed them.

23

SCANES SPINCER makes the extraordinary suggestion that the pharyngeal tonsil is meant to absorb the nasal and lacrymal secretions when one is lying down, while the lingual tonsil does the same when one is standing up, as the uvula drips on to it in /

in that position. The faucial tonsils are supposed to do something of the same sort, and the whole of them are expected to act as "sewage farm" for the contaminated nasal and buccal secretions.

²⁴
HILL also believes the tonsil to be an absorbent organ, but thinks that it has to deal with the products of salivary digestion and the buccal secretions, both of which are supposed to be absorbed by the buccal and faucial mucous-membrane, and to pass thence to small lymphatics which go to the tonsils. This is anatomically impossible, as there are no lymphatic vessels passing to the tonsil in this manner; these organs are peripheral lymph glands, not intermediate ones.

There is no reason to regard the tonsils as concerned in the absorption of nutriment. The food we use can only be absorbed after digestion, and the bolus of food before it passes the tonsils has been subjected to no digestion whatever. There is, it is true, an amylolytic ferment in the buccal fluid, but the food does not stay long enough in the mouth to have its starch converted into sugar, and, moreover, what is to be made of the case of carnivorous animals, whose normal food contains no starch, and which yet have large tonsils.

Still/

Still further objection to any theory which assumes that the tonsils have to do with the absorption of food is to be found in the consideration, that even if the faucial tonsils were occupied in this way, we should still be unable to explain the function of the pharyngeal tonsil, with which food never normally comes into contact. Now, the structure of all the tonsils is practically identical as far as the essentials go, and we are therefore entitled to assume that their functions must also be the same.

Further ²⁵ HODENPYL has made a series of very careful experiments, in the course of which he applied olive oil, melted lard, lanolin, carmine, Berlin blue, emery powder, aniline colours, salts of iron, and solution of atropine to the surface of the tonsils, and in no case did absorption of any one of these take place to any appreciable extent.

(3) Eliminating Organs.

²⁶ WILLIAM H. ASHHURST published his observations, in 1909, on cases of acute infections. He noticed that during the acute attack of an infection, patients often showed secondary involvement of tonsils in the form of acute tonsillitis. In one particular case the patient developed affection of the right tonsil several days after a septic wound/

wound of the right arm. Subsequently the left tonsil was also involved. He thus contemplates that the tonsils act as eliminating organs in acute infections, the nearest being involved first.

The explanation is, however, that the lymphoid tissue, being more susceptible to infection than other tissue, becomes secondarily involved, and not due to elimination of the offending organisms.

(4) The Immunity Theory.

²⁷
K.H. DIGBY believes that the tonsils, exposed as they are to infection, act as a defensive barrier. They receive invading micro-organisms into their crypts. Some of them are held up to form toxins, which become absorbed into the system to form antibodies. That is to say, auto-vaccination or self-immunisation takes place, inside the tonsil, for the purpose of combating disease.

²⁸
H.A. BARNES describes this theory as "the product of scientific imagination", and regards tonsils as "the vaccine laboratory of nature". He thinks the theory is a very pretty one which cannot be refuted. "If the assumption is correct, those who/

who have infected tonsils ought to be healthier than those without, whereas they are improved in health after the tonsils are removed." I. MOORE.

Personally I am inclined to accept DIGBY'S suggestion. The fact that an individual is unhealthy with infected tonsils only shows that he is getting an over dose of toxins and as such the tonsils are not capable of dealing with them.

(5) The Internal Secretion Theory.

³⁰
MASINI attributes to the tonsils a function similar to that of the suprarenal glands. He obtained a rise of blood pressure in dogs after injection of tonsillar extract.

³¹
GIRO CALDERA, however, reported negative results after an elaborate series of experiments.

I. MOORE says that "the tonsils can have no special secretion, as is shown by clinical evidence, for no symptoms have ever occurred after tonsilectomy. If the tonsils do manufacture an internal secretion it is equally shared by the other lymphoid tissue."

(6)/

(6) The Haemopoietic Theory.

This theory is based on definite histologic findings.. It relates to the production of lymphocytes in the germinal centres of the lymphoid follicles. Many of these lymphocytes have been seen to make their way through the epithelium into the crypts, whence they pass into the faucial cavity as "salivary corpuscles". In the pharynx they destroy micro-organisms. It is scarcely conceivable that of the vast number of lymphocytes produced in an active tonsil of childhood, a large proportion enter the crypts. The increased activity of cell division in the germinal centres coincides with the period of growth in the child. It is doubtless, that one of the functions of the lymphoid tissue is the production of lymphocytes for the blood; and in this service the tonsils play a very important, though by no means indispensable part

32

HUGH T. ASHBY describes the enlargement of tonsils and adenoids as an attempt on the part of nature to supply the deficiency of lymphocytes which occurs normally as the infant passes into childhood, /

childhood, and also the thymus is decreasing in size.

(7) The Protection Theory.

³⁵
GULLAND, in 1891, brought forward this theory, which attributes to the tonsils a protective power, due to the phagocytic action of the polynuclear leucocytes, by means of which the system is enabled to resist the systemic invasion of micro-organisms, and immunity secured.

He pointed out that the tonsils are organs arranged to further the reproduction of leucocytes, that this reproduction takes place by mitotic division, chiefly in the germ-centres, that the young leucocytes so formed are partly carried to the general circulation by lymphatic vessels and partly wander into the crypts by perforating the epithelium. These leucocytes thence pass to the surface of the tonsils, and take up foreign bodies, especially micro-organisms, which would otherwise pass the tonsils.

In conditions like general debility the production of leucocytes may be interfered with, and the outward stream of these cells from the tonsils/

tonsils may be arrested. This may allow pathogenic organisms from the mouth, etc., to enter the tonsil by the spaces in the epithelium, and give rise to a local or general infective process.

Such fanciful theories as that the tonsils are developed as compensatory organs for warming the inspired air when there is nasal obstruction; that they are reservoirs of nutrient like the adipose tissue, and that their function is to keep the liquor amnii from passing into the foetal pharynx, require no discussion here.

CONCLUSION

The function of the tonsils is still a debatable point. From the clinical standpoint the function of the tonsil has its most important application to the question of operative procedures; whether a complete removal is to be recommended or not. The fact that not one of the countless numbers of tonsillectomies has been shown to have had any untoward result which could be attributed to the loss of any functioning power, is enough to conclude that faucial tonsils are not indispensable, and that after their removal other organs, very likely the rest of the lymphatic system, take up their function. Hence/

Hence in cases where the tonsils are definitely diseased their removal is justifiable.

On the other hand, the idea that the tonsils have no function, or that it is one that may be easily spared, has led, to the condemning of all tonsils that show their heads, so to speak, beyond the faucial pillars, even when no symptoms are present, or only such as could be attributed to them by the utmost stretch of imagination.

GENERAL PATHOLOGY OF THE TONSILS
IN CHRONIC TONSILLITIS.

Practically all of the pathological conditions in the tonsils, with the exception of the neoplasm and certain of the specific infections, are brought about by the peculiar anatomical structure of the crypts and their tendency to retention of cellular debris. The crypts are tortuous and deep, extending practically to the capsule; their walls kept in close apposition by pressure of the surrounding lymphoid tissue. The supra-tonsillar crypts have the added disadvantage of draining upwards. The result is that a certain amount of debris is found in the crypts of all tonsils. Bacteria from the faucial cavity enter the crypts and find there a very congenial soil for development. The cryptic epithelium is thin, usually showing one or two layers of cells; it offers little mechanical resistance to the entrance of foreign particles from the crypts into the parenchyma of the tonsil. As BARNES says, "The conditions seem to be ideal for the invasion of bacteria or the absorption of the toxic products of their growth".

At birth, however, the tonsils are small
and/

and the crypts shallow. The lymphoid follicles do not appear till about the 4th month of infancy. The crypt epithelium is for the most part essentially like that of the surface, compact and many cells in thickness, degeneration due to the invasion of the lymphoid cells being absent or only slight. Plasma cells are absent from the parenchyma. ⁽³⁴⁾ BARNES

⁽³⁵⁾ DAVIS in 1912, while describing the plasma cell in the tonsil, stated that these cells are not found in the tonsils of the foetus and the new-born; and that they appear about the second or third week after birth, i.e. about the time or shortly after the time when bacteria invade the tonsillar crypts. He found them to be more numerous in the hypertrophied tonsils than in the apparently normal ones. He interprets their presence as indicating the existence in the tonsils of a chronic infectious process or the absorption of toxic or irritating products.

⁽³⁶⁾ GROWE in 1924, described the histological changes in chronic tonsillitis. He pointed out that the epithelium of the crypts is richly supplied with blood-vessels and has papillae. Destruction of epithelium with localised ulceration is associated with/



Fig. 1. Human Tonsil. High power.

Showing the broken down epithelium
of the tonsillar crypt and the cellular
debris in the crypt.

with thrombosis of the blood-vessels that are normally present in the epithelium. Thus suggesting that general systemic disturbances associated with acute tonsillitis are due to direct blood infection.

(37)
DAVIS examined a large number of tonsils histologically and summarised the important features of chronic tonsillitis.

In the present work only 50 tonsils were examined histologically. These were taken from cases of chronic tonsillitis. All the patients were above the age of 20 years the highest being 59 years.

The sections were stained with haematoxyline and eosine and Gram stains. Several sections of each tonsil were examined.

Most of the tonsils were hypertrophied. In some cases they were very large and the crypts deep and tortuous and at times contained yellowish or greenish material, often foul smelling.

The following are the changes most frequently observed:-

1. Loss of epithelium on the surface or in the crypts. The continuity of the stratified epithelium of the crypts is frequently broken at the base of the crypt. (See FIG.1) The significance of such

✓ solution/

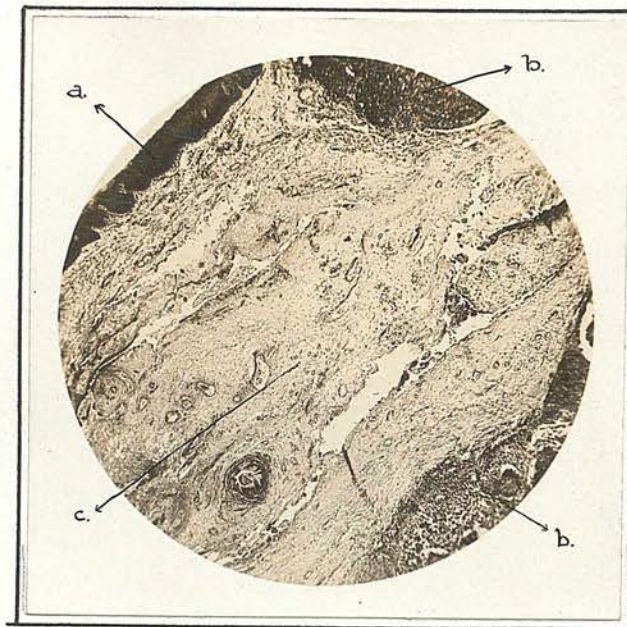


Fig. 2. Human Tonsil. Low power.
 Showing extreme degree of fibrosis.
 a. Straified squamous epithelium.
 b. Lymphoid tissue of the tonsil.
 c. Fibrous tissue.

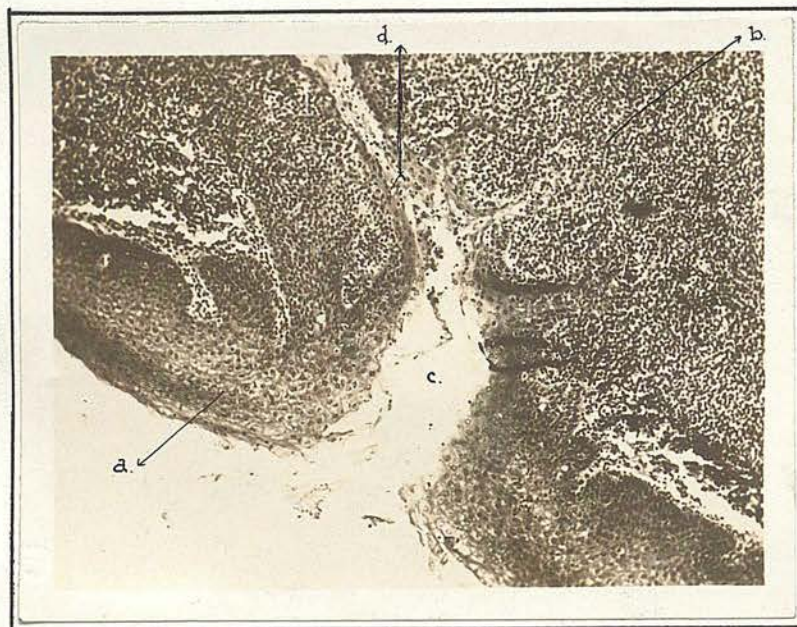


Fig. 3. Human Tonsil. High power photograph.
 Showing the opening of the crypt on to the surface. Lumen of the crypt is blocked.
 a. Surface epithelium.
 b. Lymphoid tissue.
 c. Opening of the crypt.
 d. Site of occlusion of the crypt.

solution of continuity in the stratified epithelium is obvious. Organisms can obtain a free entrance directly into the tonsillar substance, and they can escape easily in the reverse direction, from the tonsil into the mouth, and be swallowed with the saliva.

ii. Thickening of the capsule of the tonsil.

iii. An increase in the interstitial connective tissue, especially in the immediate neighbourhood of the crypts. (See FIG.II.)

iv. Deposition of cholestrine chrystals, hyaline material and cellular debris in the crypts.

v. Evidence of haemorrhage in the parenchyma or the lumen of the crypts.

vi. Adhesions in the crypts or more often blocking of the lumen of the crypts resulting in the shutting off, of the deeper parts of the crypts which contain bacteria and pus cells, etc. (See FIG.3)

vii. Hyperplasia of the endothelial cells. In the tonsils examined by the author no abscesses were observed. In the sections stained by **GRAM'S** method it was difficult to pick out organisms, but some short chained cocci were occasionally seen in the part of the tonsil nearest to a crypt. In a few cases in the deeper parts of the crypts.

It/

It is clear from the histological changes described above how a septic tonsil may supply the organisms to the blood-stream, as in the case of acute tonsillitis, or how a constriction at the top of a crypt, resulting in accumulation of necrotic material and bacteria below the obstruction may, from time to time, feed the blood-stream by emboli of bacteria in addition to those that gain entrance through large lymph channels in the tonsils.

BACTERIOLOGY OF EXTIRPATED TONSILS.

A great deal of work has been done on the bacteriology of the tonsils and their crypts. It is futile here to review the whole of the literature on this subject. It is important however to emphasize the fact, which is also borne out by the present work, that all tonsils, both normal and pathological, harbour large number of micro-organisms of varied nature. What role these micro-organisms play under normal as well as pathological conditions is a matter which is very difficult to decide. It is even difficult to say whether we are justified in saying that in spite of the large number of organisms which are present in every tonsil there is such a thing as a healthy tonsil!

(38)

FRITZ HENKE and HANS RICHTER, in 1912, recorded their investigations in connection with the bacteria found in the tonsils under normal and pathological conditions. They found:-

- (a) that the normal tonsil frequently harbours both haemolytic and non-haemolytic streptococci, and that the latter may be distinctly pathogenic and virulent;
- (b) that both groups may give rise to mild and severe tonsillitis and may lead to fatal general infections. They recorded 15 fatal injections due to non-haemolytic streptococci.

DAVIS/

(39)
 DAVIS, in 1910, studied the bacteriology of the faucial tonsils of 45 patients suffering from chronic joint affections, nephritis, endocarditis, rheumatic fever, and recurring tonsillitis and found that the flora of the crypts differed from that of the surface of the tonsils. In almost every case a pure or almost pure growth of haemolytic *S. pyogenes* was obtained from the crypts, while the predominating bacteria from the surface belonged to the *S. viridans* group.

(37)
 In 1912, DAVIS again published his findings. On this occasion he examined a very large number of tonsils from individuals of all ages, from birth to 80 years of age, and he once again confirmed his findings mentioned above.

(40)
 PILOT and DAVIS, in 1919, found the haemolytic streptococci could be recovered from the crypts of the excised tonsils in 97% of cases whereas by swab cultures only in 67%.

(41)
 PILOT and PEARLMAN, in 1921, examined a large number of adenoids and extirpated tonsils. They found *Streptococcus viridans* in 89% of the adenoids and 81% of the extirpated tonsils.

(42)
 NELLIE WALL, in 1922, examined 170 tonsils. Streptococci and *Micrococcus catarrhalis* were the/

the most constant organisms both on the surface and the depths of the crypts. Non-haemolytic streptococci occurred in 92% of cases, from the superficial surface of 75% of cases, and from the depths of the crypts of 64%.

(43)

NAKAMURA, in 1924, studied the bacteriology of 2048 tonsils. He studied the bacteriology of the parenchyma of the tonsils and tried to avoid the crypt contamination. His technique was somewhat similar to that of **LUMSDEN'S**. His object was to determine the incidence and number of the various types of streptococci and other bacteria in the tonsillar tissue.

Out of 1250 tonsils that he examined from 11th of October to 30th of May he found that 50% of the entire number revealed haemolytic, 58% green producing, 18% indifferent streptococci.

The incidence of streptococci varied according to the change in the season. Whereas the green producing colonies predominated in the month of October and then again in the later part of May the haemolytic colonies predominate in November and early December, and went on increasing till April when it fell considerably.

KEILTY/

(44)

KEILTY, in 1921, studied 385 cases. The tonsils in all cases gave some growth of organisms. He cauterised the tonsillar surface and then squeezed the substance of the tonsils from which material organisms were grown. He found that streptococci occurred 410 times. Streptococcus haemolyticus only 80 times. Staphylococci, which occurred 230 times were the next common organisms that occur in the parenchyma of the tonsils.

(45)

NICHOLAS, in 1918, working with cultures from the different parts of the oral and nasal cavities found that the tonsils gave the most numbers of streptococci. Cultures from excised tonsils showed streptococci in 75% of cases. Cultures from the crypts showed a higher % of positive results than surface cultures.

(46)

FOX and STONE, carried out an investigation in order to trace the changes in the streptococcal types of the human throat throughout the winter months, and to note whether these changes bore any definite relationship to the pathological condition likely to arise i.e. colds, sore throats, influenza etc. They found that two streptococcal groups were common; S. mitis and S. salivarius (HOLMAN) which are the usual throat inhabitants. They accounted for 81%.

81% of all the colonies examined.

They further found that the occurrence of haemolytic streptococci did appear to bear a definite relationship to local pathological conditions either as cause or effect.

THE CLASSIFICATION OF STREPTOCOCCI.

The question of adopting a classification presented a grave problem. There is so much diversity of opinion as to whether to rely on the older methods of classification based on power of haemolysis, sugar reactions and bile solubility or to adopt the more recent serological methods of classification.

BIOLOGICAL CLASSIFICATION.

Owing to the many difficulties and lack of conformity in the classification of streptococci according to serological methods, I adopted the classification according to the biochemical tests, (48) recommended by HOLMAN.

A classification based on such a basis is too clear cut and artificial to be of any permanent value. In the present poor state of our knowledge, although artificial, it appears to be the only method of classification by which results obtained by the investigations of streptococci, similar to the present one, can be passed on to other workers, so that they can be more or less interpreted by them. (49)

GORDEN'S classification was too elaborate/

TABLE. I

HAEMOLYTIC.

[illegible]

elaborate a method to be adopted in the present investigation. His method includes nine different tests, which result in the differentiation of so many types, that it is not only confusing but of little practical value.

HOLMAN'S classification consists in the division of streptococci into two large groups, viz:-

- (a) Haemolytic strains.
- (b) Non-haemolytic strains.

There are eight subdivision of each of these groups depending on their reaction on mannite, salacin and lactose. He thus divides all streptococci into sixteen groups. (**SEE TABLE I AND II.**)

TABLES I AND II.

Although HOLMAN'S classification was employed it was found essential to apply additional tests.

Pneumococci occur in great abundance in the neighbourhood of the tonsils. The cultural characters etc. of these organisms resemble considerably *S. viridans*, and it was, therefore, very essential to exclude these organisms from the non-haemolytic streptococci. The fact that pneumococci are soluble in bile or the bile salts contrary to the streptococci which are insoluble was made use of, and the bile solubility test applied. Although fermentation of inulin is a matter of doubt in the minds of several bacteriologists, it is, on the whole, taken for granted that whereas pneumococci ferment inulin most strains of streptococci do not. Inulin was, therefore, added to the list of carbohydrates employed in the fermentation test.

Special attention was paid to the presence of enterococci in the tonsils. Several writers have drawn attention to the close relationship between this organism and the gall-bladder. *S. faecalis* of English writers, includes several strains and the enterococci. The sugar fermentation was found very unsatisfactory and hence two additional tests were introduced, to differentiate between enterococci/

enterococci and other non-haemolytic streptococci, that may come under the large faecal group of organisms. The three important characters of the enterococci were taken into account. Namely, resistance to heat, aesculin fermentation and the ability of the organisms to grow on **McCONKEY'S** medium.

TESTS EMPLOYED IN THE CLASSIFICATION OF STREPTOCOCCI.

I. BILE SOLUBILITY TEST.

This is the only reliable test for the differentiation between streptococci and pneumococci.

(50)
NEUFELD noticed that if he added 0.1 cc. of normal rabbit's bile to every 1 or 2 cc. of a pneumococcal broth culture the pneumococci lysed. The streptococci, on the other hand when treated in the same way, were not affected at all.

(51)
LIBMAN and ROSENTHAL also found this differentiation very reliable, while LEVY found that Sodium taurocholate dissolves the pneumococcus and the streptococcus mucosus grown in broth, but not other streptococci.

In all the strains investigated in the present work this test was carried out as follows:-

A 20 to 24 hours culture of the organisms in 1% glucose broth was taken. 0.9 of a c.c was transferred to a small test tube. To this was then added 0.1 cc of a 10% solution of sodium taurocholate. The tube was incubated, after having been shaken properly, /

properly, for $\frac{1}{2}$ an hour and then kept at the room temperature for another $1\frac{1}{2}$ hrs. The organisms were always found to be insoluble.

A known culture of pneumococcus 1 was treated in the same way. Complete lysis occurred.

2. HAEMOLYTIC TEST.

In every case blood agar plates were used for growing organisms. They were very useful means of separating the organisms and also seeing whether they produced haemolysis or not. This was the method employed by SCHOTTMULLER originally. Although some bacteriologists have objections to the method, I found it very convenient in the present work. All the plates were made by the same individual and in the same way so that they were of the same density. Human blood was used in the proportion of 1 in 12.

In addition, however, another test was carried out as described by THOMSON. (52)

Two tubes, each containing 0.6c.c. of nutrient broth and 0.6cc. of sheep's serum, were heavily inoculated with the strain of streptococci to be examined and placed in the incubator at 37°C. for 16 to 18 hrs in order to obtain the maximum content of haemolysin.

3.8 c.c./

3.8 cc. of normal saline were put into a tube, which contained 1 cc. of supernatant fluid from centrifuged 16 to 18 hrs. cultures of streptococci. To this 0.2 cc. of the prepared rabbit's blood was added. The mixture was then well shaken and placed in the incubator for two hours at 37 C. After this the tubes were placed in the ice chest, and the readings were taken the following morning,

A control tube containing 3.8 cc. of normal saline and 0.2 cc. of the defibrinated washed rabbit's blood was put up with each experiment.

To further control this method of investigation two strains of streptococci, known to be haemolytic, were also tested. These showed complete haemolysis.

This test was carried out on several strains and was done more with the idea of checking the blood-agar plates. All the non-haemolytic strains failed to produce any haemolysis by the method described above.

3. CARBO-HYDRATE FERMENTATION TESTS.

(48) The sugars used were those indicated by
 HOLMAN . They were as follows:-
 Inulin/

Inulin - A polysaccharide.

Lactose -- A disaccharide.

Mannite - A hexahydric alcohol.

Salicin - A glucoside.

The sugars were made up as follows:-

10% solutions of various sugars mentioned above were made and sterilised for 20 minutes each day on three successive days.

2% of agar and 1% peptone water were dissolved in the steamer. This is then filtered and 1% Litmus is added to it. The litmus, of course, having been previously sterilised.

The sugars are then mixed with the peptone-agar in the proportion of 2 cc. of the former to 200 cc. of the latter thus giving the final concentration of the sugars to be 1%. This is then tubed off.

About $\frac{1}{2}$ cc. of the ascitic fluid was then added to each tube and the tubes left in the incubator for 24 hrs. to see if they were alright.

In all cases the sugars were heavily inoculated, usually 4 loopfuls, from a 24 hrs. culture. The tubes were capped in order to avoid drying of the medium. The water-of-condensation was, from time to time, allowed to wet the entire surface of the slopes.

The/

The sugar to show the earliest reaction was lactose. The tubes, in all cases, were left for eight to nine days in the incubator at 37 C. before the reactions were charted.

Control Tubes. A set of control tubes which were not inoculated were also left in the incubator for the same number of days in order to see if any changes occurred in them. In no case did these tubes show any alteration of colour.

4. RESISTANCE TO HEAT.

DIBLE,⁽⁵³⁾ in 1921, working on the enterococcus reported the characteristic property of this organism. Broth cultures survive exposure to 60 C for 30 minutes while other varieties of streptococci are killed in five to ten minutes. He further says, "as far as the experience of the writer goes this test is more constant than any other test yet introduced."

This test was carried out on all the strains investigated. Twenty to twenty-four hours cultures were kept in the water bath at 60°C for 20 minutes. Sub-cultures were made from these tubes and kept in the incubator for 24 hours, when in heat resistant strains profuse growth occurred.

5. AESCULIN FERMENTATION.

HARRISON and VANDER LACK,⁽⁵⁴⁾ in 1909 introduced this test. MYERS and SCHOUFELD confirmed it by applying it to a considerable number of enterococci and other streptococci. They said that it was the best single differential test available.

This test was carried out on all the strains/

strains investigated. The positive, i.e. the aesculin fermenters turned the opalescent fluid into dark brown and nearly black in 24 to 36 hours.

The fluid medium of HARRISON and VAN DER LACK is made in the following way. The following ingredients are taken:-

Peptone	1.5	Grams
Sodium taurocholate	0.5	"
Aeschulin	0.1	"
Iron citrate	0.05	"
Distilled water	100	c.c.

These are then put into a steamer and steamed for 30 minutes and then allowed to cool. After it is cool then filter. It is then sterilised for 20 minutes each day on two successive days and is then ready for use.

Each tube is inoculated with 3 loopfuls of the 24 hour culture and then incubated for 24 to 36 hours.

6. MORPHOLOGY.

Although the mode of growth in the form of a chain constitutes the essential generic feature of the streptococci, morphology is of singularly little help when we attempt to use it as a means of specific/

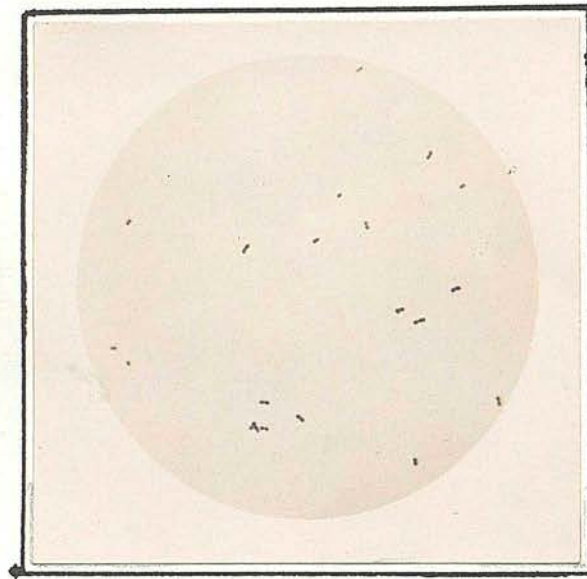


Fig. 4. Enterococci obtained from a human tonsil.

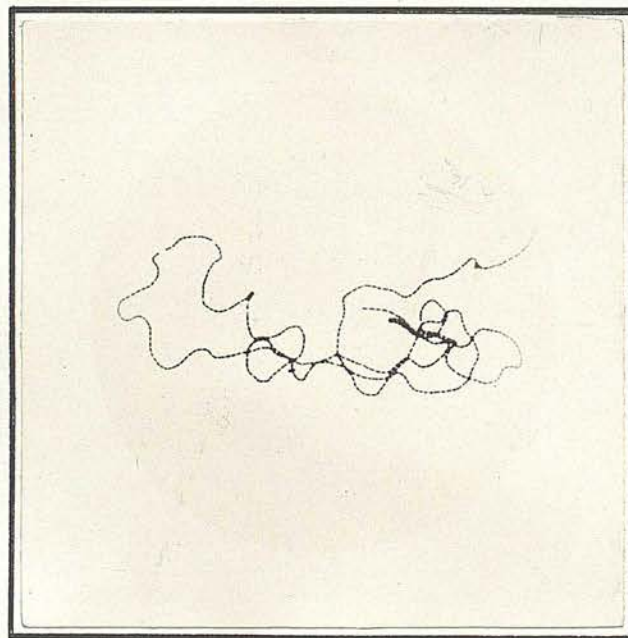


Fig. 5. A non-haemolytic streptococcus
Showing extremely long chains.

specific classification. The appearances are often identical with those of pneumococci which further reduces the value of morphology in classification.

(55)
ANDREW, speaking on the evolution of streptococci says, "the evolution of minute forms of life has proceeded on the lines of physiological rather than morphological specialisation. In the endeavour to differentiate species the bacteriologist is every where compelled to take into account the sum total of the biological characters of any given form."

The question of short and long chains was of interest. Once upon a time that formed a means of classification. The typical appearance of an enterococcus in the form of diplococci with elongate or lanceolate cocci was particularly interesting. In most of the strains which gave other characteristics of enterococcus this was seen. The accompanying microphotograph 4 shows it well.

On three occasions the chains were found to be very long and extended over several fields under the microscope. This was the streptococcus conglamoratus or longus of German writers. Fig. 5 shows/

shows the extraordinary long chain.

Usually the chains were of medium length is consisting of 3 to 8 cocci. A note was taken in every case about the average length of the chains.

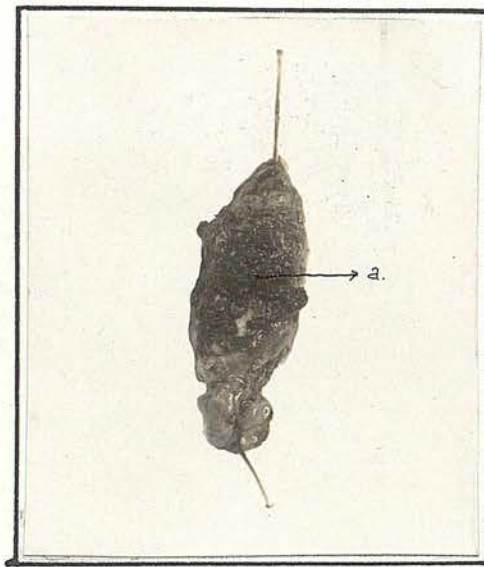


Fig. 5. Human Tonsil, as seen pinned on the cork with its capsular surface upwards.

a. The area of the capsule after it has been cauterised.

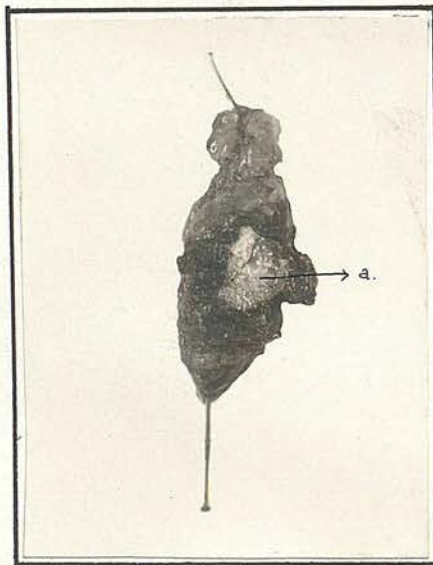


Fig. 6. Human Tonsil as seen pinned on the cork with its capsular surface directed upwards.

a. Parenchyma of the tonsil exposed after making a window in the capsule.

**TECHNIQUE for OBTAINING STREPTOCOCCI from the
PARENCHYMA of the EXTIRPATED TONSILS.**

In the present investigation all the tonsils were taken from the Ear, Nose and Throat Department of the R.I.E. They were all removed from adults of more than 20 years of age. Most of them were removed by dissection, under a local anaesthetic. They were then carried to the Surgical Department of the Edinburgh University, in clean bottles. They were dealt with, within an hour or two of their removal. The following procedure was adopted:-

The tonsil was pinned on to a piece of cork, with its capsular surface directed upwards. To exclude the superficial contamination, the capsule is cauterised over a portion about the size of a shilling, by means of a hot piece of metal. I used the handle of a broken scalpel. The accompanying photograph shows the cauterized capsular surface. (See Fig. 5.)

The cauterised capsule is then opened into by means of a pair of sterilised scissors, and a window is made. The parenchyma of the tonsil is then exposed. Photograph No.6 shows the window in the capsule.

A/



A small portion of the lymphoid tissue thus exposed is removed, and after being finely divided up with scissors is immediately put into a test tube containing about 15 c.c. of a 1% glucose broth.

It must be noted here that although superficial contamination was thus avoided, it was found very difficult to avoid the deeper portions of the crypts. This contamination was ignored. So that the micro-flora obtained from the extirpated tonsils, was from the parenchyma as well as the deeper crypts.

The tube is placed in the incubator at 37°C for 24 hours when a profuse growth is obtained. The organisms tend to settle down at the bottom of the tube in the form of a sediment.

Films are made at this stage. They are stained with GRAM'S stain and examined. The characteristics of the chains and presence of other organisms is noted.

The organisms are then plated on to blood-agar plates. LUMSDEN⁽⁸⁾ found that the "shake culture" method was more useful, and gave better results than smearing the surface of the medium by means of a/
a/

a platinum loop. I tried both methods and found them equally good. Whereas the shake culture method was cumbersome, the smearing was much easier to carry out.

The blood-agar plates are then left in the incubator for a further period of 24 hours. The plates are then examined for typical non-haemolytic colonies, which may or may not show green colouration. Note is also taken of the other organisms that may be present, in addition to the non-haemolytic streptococci, although no attempt was made at all to isolate and study them. Attention was confined to the non-haemolytic streptococci alone because, as has been said before, A.L. WILKIE ⁽⁶⁰⁾ found that only non-haemolytic streptococci were present in the cystic lymph gland, and were perhaps the causal organisms in cholecystitis.

A single typical colony is then picked up and transferred to another test tube containing 1% glucose broth. Usually 2 or 3 tubes were inoculated from one plate and then examined and classified.

After 24 hours a pure growth of the organism is obtained in the glucose broth.

Films are again made, stained with GRAM'S stain/

stain and examined for purity of culture. The organisms are then transferred to the "chocolate medium" and stored. From this stock culture, fresh cultures are made from time to time, as they are required either for carrying out the various tests described above, or to prepare emulsions for injecting animals.

Before strain is declared as one of a non-haemolytic streptococcus, the bile solubility test, heat resistance and, in many cases haemolytic tests, were applied. In all cases the organisms were classified according to **HOLMAN'S** classification, except in the case of an organism being an enterococcus.

It must be pointed out here, that although the technique described above was the most satisfactory from all points of view, it was not entirely free from faults.

One of the greatest defects lay in the use of fluid medium for the growth of original cultures. It is well known that when a mixture of organisms is allowed to grow in a rich fluid medium, like 1% glucose broth, some organisms outgrow the others, and, therefore, one cannot make proper survey of all the strains present.

The/

The alternative method of plating the emulsion of tonsillar parenchymatous tissue on to the blood-agar plates directly was also tried but it was not satisfactory. Several times where one obtained a growth, by the technique described above, one got negative results by the second method of direct plating.

The second defect lay in the difficulty of excluding deeper crypt contamination. This, however, could not be avoided on account of anatomical reasons. The crypts extend very deep down into the substance of the tonsil, and are very numerous. In the cases investigated by the new method of tonsil puncture, however, I was able to exclude that error. The organisms obtained by tonsil puncture were, therefore, those that had passed the tonsil barrier and were on the point of entering the general lymphatic system.

PRESENT INVESTIGATION.

As has been said before, the object of the present investigation was to find out, whether, in cases of chronic cholecystitis, the faucial tonsils, especially when they are diseased, harbour any specific non-haemolytic streptococci, which, when injected into rabbits intravenously show elective affinity for the gall-bladder.

In order to carry out the above mentioned object, it was necessary to select cases which gave some evidence of gall-bladder disease.

Although several workers have already determined the incidence of streptococci in the tonsils, it was considered necessary to investigate the of non-haemolytic streptococci in the tonsils, as determined by technique described and employed in the present investigation.

In all 110 tonsils were investigated.
this total includes:-

- (1) 60 tonsils from 30 cases. All these cases had no other trouble except chronic tonsillitis. Patients were above the age of 20 years. The tonsils were removed by/

by dissection under a local anaesthetic. Their bacteriological characteristics etc. are tabulated for convenience in TABLE 3.

TABLE III.

- (2) 30 tonsils from 26 selected cases were investigated. These were also removed by dissection. The organisms from these were employed for animal inoculation. The bacteriological characteristics etc. are also tabulated in TABLE 4.
- (3) 20 tonsils were investigated when I wanted to compare the organisms obtained by the new method of tonsil puncture performed before tonsillectomy with the organisms obtained from the same tonsils after their removal by dissection. The bacteriological characteristics etc. are tabulated in TABLE 6. (See table 6 in Part II of this thesis.)

T A B L E. III.

BACTERIOLOGY OF EXTIRPATED TONSILS.
STUDY OF NON-HAEMOLYTIC STREPTOCOCCI.

NO. of Case.	1		2		3		4	
	R.	L.	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Strept. medium chains Do. No. Haemolysis	Strept. medium chains Do. No. Haemolysis	Staphyl. & Strept. m. chains. Do. No. Haemolysis	Strept. & Staphyl. l. chains Do. No. Haemolysis	Staphyl. & Strept. l. chains Do. No. Haemolysis	Strept. long chains Do. No. Haemolysis	Strept. medium chains Do. No. Haemolysis	Strept. medium chains Do. No. Haemolysis
Growth on blood-agar plates	Green	Green	White	Green	White	Green	Green	Green
Growth on chocolate medium	-	-	-	-	-	-	-	-
Bile solubility	-	-	-	-	-	-	-	-
Heat resistance	-	-	-	-	-	-	-	-
Haemolysis test	o	o	o	o	o	o	o	o
SUGAR REACTIONS								
Lactose	+	+	+	+	-	+	+	+
Mannit	-	-	+	-	-	-	-	-
Salacin	-	-	-	-	-	-	-	-
Inulin	-	-	-	-	-	-	-	-
Aeschulin	-	-	-	-	-	-	-	-
Classification	S. Saliv.	S. Saliv.	S. Mitis.	S. Saliv.	S. Ignavus.	S. Saliv.	S. Saliv.	S. Saliv.
Remarks								

No. of Case.	5		6		7		8	
	R.	L.	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Staphyl. & Strept. m. chains	Staphyl. & Strept. med-ium chains	Strept. long chains	Strept. long chains	Staphyl. & Strept. med-ium chains	Staphyl. & Strept. m. chains	Staphyl. & Strept. m. chains	Staphyl. & Strept. M. Chains.
Growth on blood-agar plates	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis
Growth on chocolate medium	white	Green	Green	Green	White	White	Green	Greens
Bile solubility	-	-	-	-	-	-	-	-
Heat resistance	-	-	-	-	-	-	-	-
Haemolysis test	0	0	-	-	0	0	0	0
SUGAR REACTIONS								
Lactose	+	+	-	-	+	+	+	+
Mannit	+	-	+	+	+	+	-	-
Salacin	-	-	+	+	-	-	-	-
Inulin	-	-	-	-	-	-	-	-
Aeschulin	+	-	-	-	-	-	-	-
Classification	S. mitis.	S. Saliv.	S. non-Haemolyticus	S. non-Haemolyticus	S. Mitis	S. Mitis.	S. Saliv.	S. Saliv.
Remarks								

NO. of Case.	9		10		11		12	
	R.	L.	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Strept. Medium chain	Strept. short chains	Strept. long chains	Strept. long chains	Staphyl. & Strept. l. chains	---	Staphyl. & Strept. v.v. long chains	Staphyl. & Strept l. chains
Growth on blood-agar plates	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	Do. No Haemolysis	---	Do. No Haemolysis	Do. No Haemolysis
Growth on chocolate medium	Green	Green	White	White	Green	---	Green	White
Bile solubility	-	+	-	-	-	Growth	-	-
Heat resistance	-	-	-	-	-	---	-	-
Haemolysis test	-	-	+	+	0	---	0	0
SUGAR REACTIONS	Lactose	0	+	+	+	NO	+	+
	Mannit	0	+	+	-	---	+	+
	Salacin	0	-	-	-	---	-	-
	Inulin	+	-	-	-	---	-	-
	Aeschulin	-	-	-	-	---	-	-
Classification	S. Saliv.	Pneumo-coccus.	S. Pyogenes	S. Pyogenes	S. Saliv.	---	S. Mitis.	S. Mitis
Remarks								

NO. of Case.	13		14		15		16	
	R.	L.	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Staphyl. & Strept. l. chains	Staphyl. & Strept. l. chains	Strept. l. chains	Staphyl. l. chains	Staphyl. & Strept. m. chains	Staphyl. & Strept. m. chains	Staphyl. & Strept. m. chains	Staphyl. & Strept. m. chains
Growth on blood-agar plates	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do.
Growth on chocolate medium	Green	Green	Green	Green	White	White	White	Green
Bile solubility	-	-	-	-	-	-	-	-
Heat resistance	-	-	-	-	-	-	-	-
Haemolysis test	-	-	0	0	0	0	0	0
SUGAR REACTIONS								
Lactose	+	+	+	+	-	-	+	+
Mannit	-	-	-	-	-	-	-	-
Salacin	-	-	-	-	-	-	+	-
Inulin	-	-	-	-	-	-	-	-
Aeschulin	-	-	-	-	-	-	-	-
Classification	S. Saliv.	S. Saliv.	S. Saliv.	S. Saliv.	S. ignavus	S. ignavus	S. non-Haemolyticus	S. Saliv.
Remarks								

NO. of Case.	17		18		19		20	
	R.	L.	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Strept. l. chains	Strept. v.v.l. chains	Strept. s. chains	Staphyl. & Strept. s. chains	Staphyl. & Strept. medium chains	Staphyl. Strept.	Strept. l. chains	Strept. l. chains
Growth on blood-agar plates	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.
Growth on chocolate medium	Green	Green	Green	Grey	White	White	Green	White
Bile solubility	-	-	-	-	-	-	-	-
Heat resistance	-	-	±	+	-	-	-	-
Haemolysis test	0	0	-	-	-	-	-	-
SUGAR REACTIONS								
Lactose	+	+	+	+	+	+	+	+
Mannit	-	-	+	-	+	+	+	+
Salacin	-	-	+	-	-	-	-	-
Inulin	-	-	-	-	-	-	-	-
Aeschulin	-	-	-	+	-	-	-	-
Classification	S. Saliv.	S. Saliv.	S. faecalis.	Entero Coccus	S. Mitis	S. Mitis	S. Saliv.	S. Mitis.
Remarks								

NO. of Case.	21		22		23		24	
	R.	L.	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Staphyl. & Strept. l. chains	Staphyl. & Strept. l. chains	Staphyl. & Strept. m. chains	Staphyl. & Strept. m. chains	Strept. l. chains	Strept. l. chains	Staphyl. & Strept. s. chains	Staphyl. & Strept. m. chains
Growth on blood-agar plates	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis
Growth on chocolate medium	Green	Green	White	White	Green	Green	Green	Green
Bile solubility	-	-	-	-	-	-	-	-
Heat resistance	-	-	-	-	-	-	-	-
Haemolysis test	0	0	-	-	0	0	-	-
SUGAR REACTIONS								
Lactose	+	+	+	+	+	+	+	+
Mannit	-	-	+	-	-	-	+	-
Salacin	-	-	-	+	-	-	+	-
Inulin	-	-	-	-	-	-	+	-
Aeschulin	-	-	-	-	-	-	-	-
Classification	S. Saliv.	S. Saliv.	S. Mitis	S. non-Hae-molyticus I	S. Saliv.	S. Saliv.	S. Faecalis	S. Saliv.
Remarks								

No. of Case.	25		26		27	
	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Strept. long chain	Strept. long chain	Staphyl. Strept. l. chains	Staphyl. Strept. l. chains	Strept. short chains	Strept. long chains
Growth on blood-agar plates	Do. No. Haemolysis	Do.	Do. No. Haemolysis	Do.	Do. No. Haemolysis	Do.
Growth on chocolate medium	White	White	Green	Grey	White	Green
Bile solubility	-	-	-	-	-	-
Heat resistance	-	-	-	-	+	-
Haemolysis test	0	0	0	0	0	0
SUGAR REACTIONS						
Lactose	+	+	+	+	-	+
Mannit	+	+	-	+	-	-
Salacin	-	-	-	-	-	-
Inulin	-	-	-	-	-	-
Aeschulin	-	-	-	-	+	-
Classification	S. Mitis.	S. Mitis	S. Saliv.	S. Mitis.	Enterococcus	S. Saliv.
Remarks					McConkey's + Growth	

No. of Case.	28		29		30	
	R.	L.	R.	L.	R.	L.
Growth on glucose broth	Staphyl. & Strept. l. chains	Strept. Long chains	Strept. medium chains	Strept. long chains	Staphyl. & Strept. chains. l.	Staphyl. & Strept. l. chains
Growth on blood-agar plates	Do.	Do.	Do.	Do.	Do.	Do.
Growth on chocolate medium	White	White	Green	Green	Green	Green
Bile solubility	-	-	-	-	-	-
Heat resistance	-	-	-	-	-	-
Haemolysis test	-	-	0	0	0	0
SUGAR REACTIONS						
Lactose	+	-	+	+	+	+
Mannit	+	-	-	-	-	-
Salacin	-	-	-	-	-	-
Inulin	-	-	-	-	-	-
Aeschulin	-	-	-	-	-	-
Classification	S. Mitis.	S. ignavus	S. Saliv.	S. Saliv.	S. Saliv.	S. Saliv.
Remarks						

SUMMARY OF THE RESULTS.

Of the tonsils examined, the incidence of organisms obtained was as follows:-

1. One tonsil gave no growth.
 2. Pneumococci were obtained from 2 tonsils.
(1 Case).
 3. Haemolytic streptococci from 2 tonsils.
(1 Case).
 4. Non-haemolytic streptococci occurred on 105 occasions. In 57 tonsils they occurred in pure culture.
 5. Staphylococcus albus (S.pharyngis) appeared on 58 occasions. Never in pure culture always along with the non-haemolytic streptococci.
-

CONCLUSIONS.

- I. By the technique used for obtaining organisms from the parenchyma of the tonsils, a large number of non-haemolytic streptococci were obtained.
 - II. Non-haemolytic streptococci occurred in 95% of Cases. *S. viridans* occurred 70 times, i.e. 66% of the total number of non-haemolytic streptococci.
 - III. Pure cultures of non-haemolytic streptococci occurred in 54% of Cases.
 - IV. Pneumococci and haemolytic streptococci were very rare.
 - V. *Bacillus coli* was conspicuous by its entire absence.
 - VI. Incidence of non-haemolytic streptococci in the tonsils of patients above the age of 20 years is extremely high.
-

EXPERIMENTS WITH ANIMALS.

Rabbits were exclusively used during the course of this research. In all 85 rabbits were employed. As far as possible medium sized tame healthy looking animals were chosen. (56) MACKIE AND McCARTNEY point out the important points which ought to be borne in mind when selecting rabbits for experimental purposes. It was seen that the animals should be plump, the fur should be in good condition, should have no snuffles or subcutaneous abscesses.

With all the care that one may take, it is very difficult to find a perfectly healthy rabbit amongst the animal house residents. Most of them suffer from coccidiosis and intestinal worms and are extremely liable to inter-current infections.

There is no other animal which is suitable for the type of experiments carried out and therefore rabbits were used exclusively.

NORMAL RABBIT. Two rabbits were taken from the stock and were killed with chloroform in order to see the normal structure of the animal, both naked eye and histologically, so that one could compare the normal with the diseased organs. It would be/

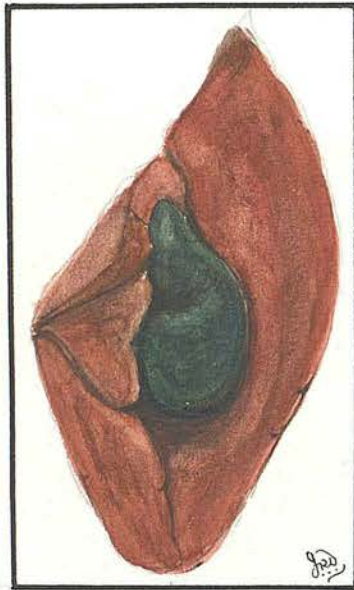


Fig. 7. Rabbit's Gall-bladder. Water Colour drawing.
Showing normal appearance.

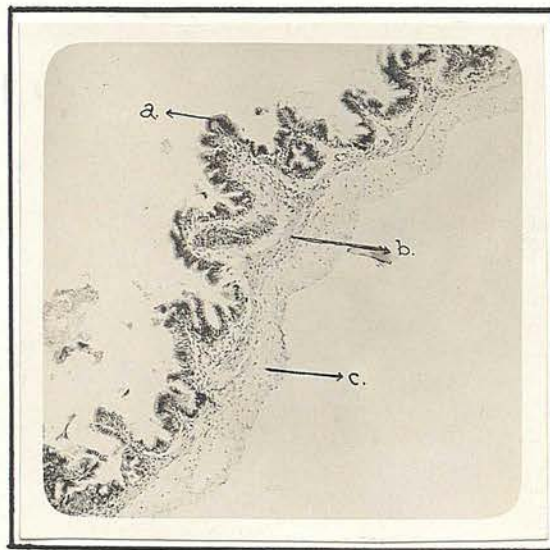


Fig. 8. Rabbit's Gall-bladder. High power.
Showing the normal histology of the gall-bladder.
a. Mucous membrane.
b. Tunica propria or media.
c. Tunica externa.

be out of place here to describe the entire anatomy of the rabbit. It is essential, however, that a short description of the rabbits gall-bladder may be given with advantage. During the course of 85 autopsies I had an opportunity of examining the gall-bladder both macroscopically and microscopically.

THE GALL-BLADDER OF THE RABBIT.

The accompanying water-colour drawing (FIG. 7) and the high-power microphotograph (FIG. 8) gives the typical appearance of an average gall-bladder in the rabbit. This organ, however, shows remarkable variations in size, shape and appearance.

Normally when the gall-bladder is full of bile, it is an inch to an inch and a quarter in length and half an inch in width. Its wall is thin and translucent. The greenish-blue bile showing through the wall gives the organ its characteristic appearance.

The fundus of the organ remains completely covered over by the lobe of the liver and therefore the gall-bladder does not come in contact with the abdominal wall.

The cystic duct begins at the neck of the gall-bladder and passes, covered over by the liver, to/

to join the common bile duct or sometimes the right bile duct from the liver.

Rabbit's Gall-bladder is richly supplied with blood. The cystic artery is small though relatively large and lies in close contact with the cystic duct. It passes down to the neck and then gives several branches which encircle the organ. It is through this artery that one contemplated the organisms to reach the gall-bladder, and produce disease. The artery ultimately embeds itself into the substance of the wall, and finally ends in the submucosa.

HISTOLOGY OF RABBIT'S GALL-BLADDER.

Microscopically the wall of the gall-bladder can be divided into three coats.

1. Mucous Membrane, consists of small columnar epithelium which is thrown into folds. The epithelium is supported by fine connective tissue into which the small blood-vessels end. This layer may be described as the submucous layer.
2. Tunica propria, consists of fibrous tissue and a few muscle fibres. This is the coat which enables the organ to contract and expell bile during the height of digestion. This layer also contains/

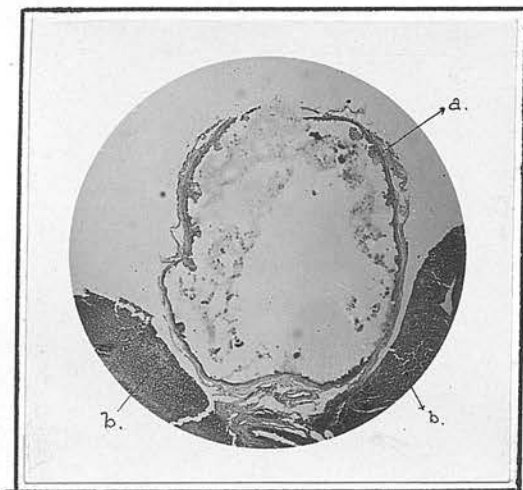


Fig. 9. Rabbit's Gall-bladder. Low power.

Shows the entire cavity in the section.

a. Wall of the gall-bladder.

b. Liver.

contains the larger vessels etc.

3. Tunica externa, consists of a thin layer of connective tissue whose function is purely protective. Its thickness varies considerably in various specimens.

VARIATIONS SEEN IN THE RABBIT'S GALL-BLADDER.

The variations seen were either in size, shape or appearances, chiefly due to developmental errors.

1. Variations in size. (a) In one rabbit at operation I could not find the gall-bladder at all. On post mortem examination the gall-bladder was seen. It was the size of a large pin-head. It had a very long cystic duct leading from the neck in the usual way. (See FIG. 9.) (b) In another rabbit the gall-bladder was three times the normal size. It extended beyond the liver margin and was distended with bile.
2. Variations in shape. (a) Instead of the usual pear shape in one case, the gall-bladder was very narrow and elongated i.e. somewhat sickle shaped. (b) In another case it was about twice the breadth of the normal. On opening this one a septum/

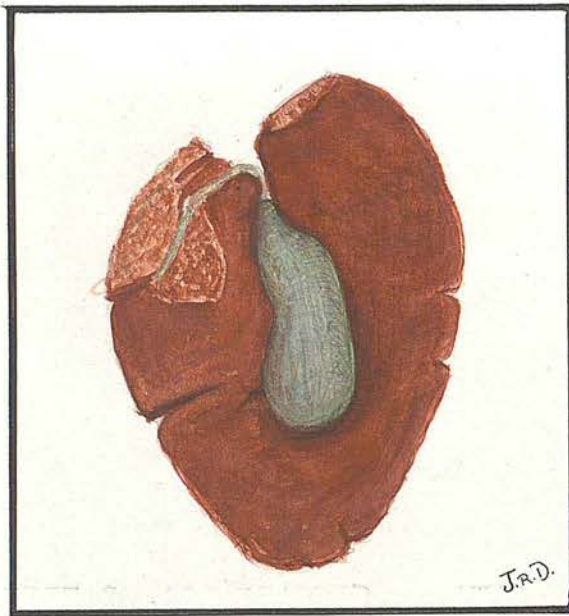


Fig. 10. Rabbit's Gall-bladder. Water Colour drawing.
Showing light blue appearance.

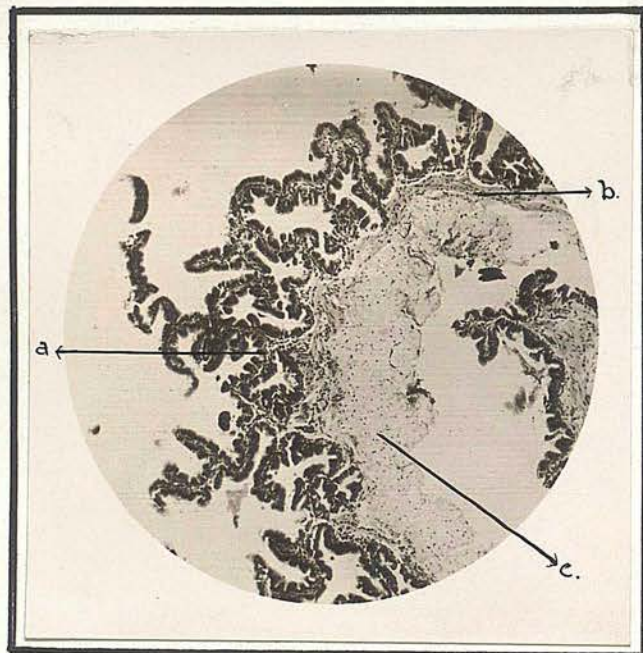


Fig. 11. Rabbit's Gall-bladder. High power.
Showing hyperplasia of the mucous membrane.

- a. Mucous membrane.
- b. Tunica media.
- c. Tunica externa.

septum was seen dividing the cavity into two chambers which communicated with each other near the neck of the organ. There was only one cystic duct. (c) In another case the gall-bladder was of the normal size, but had a small pocket-like diverticulum which was situated near the neck of the organ. This pocket communicated with the general cavity of the organ. It appeared as if this was the rudiments of a second gall-bladder.

3. Variation in colour. Colour of the gall-bladder varies considerably, depending on the thickness of the wall and the concentration of the bile. It varies from a deep bluish green to a light blue. The accompanying water-colour drawing (FIG. 10.) shows the latter appearance. The microphotograph (FIG. 11.) shows no evidence of disease. Hyperplasia of the mucous membrane is marked. On three more occasions I noticed the same coincidence of light colour of the gall-bladder, and hyperplasia of the mucous membrane.

TECHNIQUE OF INJECTIONS.

The non-haemolytic streptococci obtained from the tonsils either directly from extirpated tonsils or indirectly by the method of tonsil-puncture described in Part II, were used for injections. The organisms were kept alive on the chocolate medium. It was found necessary to make new cultures every 3 or 4 weeks to keep the organisms alive.

Every time fresh cultures were made from the stock by growing on the 1% glucose broth for 24 hrs. As a routine 15 cc. of glucose broth was used so that all degrees of oxygen tension was available for the growth of organism in these tall tubes. After 24 hrs. the organisms settle down at the bottom of the tube. The supernatant fluid is poured off and enough sterile saline is added to make up the suspension containing 250 millions per cubic centimeter. This was done by comparing the emulsions with standard opacity tubes.

To ensure the purity of the emulsions, films were often made and examined before injecting them.

All the injections were given intra-venously in the marginal ear vein. The ear was dry-shaved and/

and the veins made prominent by pressing between the point of injection and the heart. Rubbing the ear with xylol was very satisfactory in bringing out the veins for injections. All the injections were made by a small sized hypodermic needle and were done slowly.

DOSAGE. ROSENOW⁽⁵⁾ used very large doses for injections. A.L. WILKIE⁽⁷⁾ on the other hand found that small doses given over long period of several months was quite efficient to produce marked changes in the animal's gall-bladder. In the present investigation the number of organisms injected, varied. In the earlier part I gave from 3 to 5 c.cs of the suspension (250 million organisms per cc.) every fifth day. In the latter part of the work, injections were given at weekly intervals.

The dose never exceeded 5 cc. The animal was never given more than 12 doses.

EXAMINATION OF THE ANIMAL.

The animals either died or were killed with chloroform. Post mortem examination was carried out as soon as possible after the death of the animal. In all cases the following organs were examined. Heart, lungs, stomach and intestine, appendix, spleen, kidneys and the urinary bladder, and the gall-bladder./

bladder. Whenever an organ gave the slightest suspicion of disease it was sectioned.. The gall-bladder, on the other hand, was sectioned in all cases. Sections were stained with Haemotoxyline and Eosine and Gram stains. Several sections of each organ were examined; records were taken in all cases. These are put together, with the clinical histories of cases examined, in the appendix of this thesis.

A SHORT NOTE ON THE CASES STUDIED
FOR ANIMAL INOCULATION.

Animals were inoculated with non-haemolytic streptococci obtained from the tonsils of selected cases. In the first series, where the organisms were obtained from extirpated tonsils, only 26 cases were studied. In all cases the patients were above the age of 20 years.

13 cases out of these 26 cases were those where the clinical history was suggestive of chronic cholecystitis. In 1 out of these 13 cases the organisms were obtained from a tooth abscess instead of the tonsils. The other 13 cases were taken at random of patients who showed no abdominal disorder, but merely suffered from chronic tonsillitis. These were control cases. They were used to see whether any secondary lesions are produced by injecting non-haemolytic organisms obtained from tonsils of patients who although have repeated attacks of tonsillitis yet do not show any evidence of secondary lesions.

In every cases the patient was examined carefully by the author. Complete clinical history was taken with special attention to the alimentary system/

system. The abdomen was examined for tenderness in the region of the gall-bladder, appendix etc. Records of the clinical history and physical examination are given in the appendix.

It may be noted here, that the question of oral sepsis was of particular interest. In all cases a note was taken of the condition of teeth. It was found, as is the experience of other people, that the teeth are quite as often bad as the tonsils. So that although the tonsils may be the site of focal-infection, the part played by the diseased teeth may equally be important in the production of secondary lesions in the abdominal viscera.

In the earlier part of the work usually one tonsil was studied histologically and the other bacteriologically. But this was soon given up. Thus 30 tonsils were examined bacteriologically from 26 cases studied.

Table 4 gives the details of the bacteriology of these cases.

TABLE 4/

T A B L E. IV.
BACTERIOLOGY OF THE EXCISED TONSILS - (Selected Cases)
STUDY OF NON-HAEMOLYTIC STREPTOCOCCI.

No. of Case	1	2	3	4	5	6	7
Growth on glucose Broth	Staphyl & Strept. L. Chains.	Staphyl & Strept. S. Chains.	Staphyl & Strept. L. Chains.	Strept. Long Chains.	Staphyl. & Strept. L. Chains.	Staphyl. & Strept. L. Chains.	Strept. Medium Chains.
Growth on Blood-agar plates	Do No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis
Growth on chocolate medium	Green	Milky	Green	Green	Grey	Grey	Green
Bile Solubility	-	-	-	-	-	-	-
Heat resistance	-	+	-	-	-	-	-
Haemolysis	-	-	-	0	-	0	-
SUGAR REACTIONS							
Lactose	+	+	+	-	-	-	+
Salacine	-	-	-	+	-	-	-
Mannit	-	-	-	-	-	-	-
Inulin	-	-	-	-	-	-	-
Aëschulin	-	+	-	+	-	-	-
Classification	S. Saliv.	Entero-coccus	S. Saliv.	S. Equinus	S. Ignavus	S. Ignavus.	S. Saliv.
Remarks		McConkey's Growth +					

No. of Case	8	9	10	11	12	13
Growth on glucose Broth.	Staphyl. & Strept m. Chains.	Strept. medium chains.	Strept. Long Chains.	Staphyl. & Strept. M.Chains.	Strept. Medium Chains.	R. L.
Growth on Blood-agar plates	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis
Growth on chocolate medium	White	Green	White	White	White	Green
Bile Solubility	-	-	-	-	-	-
Heat resistance	-	-	-	-	-	+
Haemolysis	0	-	-	0	-	-
SUGAR REACTIONS						
Lactose	+	+	-	+	+	+
Salacine	+	-	+	-	+	-
Mennit	-	-	-	+	-	-
Inulin	-	-	-	-	-	-
Aeschulin	-	-	-	-	-	+
Classification	S. Mitis.	S.Saliv.	S.Equinus	S.Non-Haemolyticus I.	S.Mitis.	S.Saliv. Enterococcus
Remarks						McConkey's Growth +

T A B L E IV. Cont.

No. of Case	14	15	16	17	18	19	20	21
Growth on glucose Broth	Staphyl. & Strept. S.Chains.	Strept. Long & S.Chains.	Staphyl. & Strept. S.Chains.	Strept. Long Chains	Strept. I.Chains.	Strept. I.Chains	Staph. S.Chains	Staphyl. & Strept. S.Chains.
Growth on Blood-agar plates	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis
Growth on chocolate medium	White	Green	Grey	White	Green	White	Green	Green
Bile Solubility	-	-	-	-	-	-	-	-
Heat resistance	+	+	+	-	+	-	+	+
Haemolysis	-	-	-	0	-	-	-	-
SUGAR REACTIONS								
Lactose	-	+	+	+	+	+	+	+
Salacine	-	-	-	-	-	-	-	-
Mannit	-	-	-	+	-	-	-	-
Inulin	-	-	-	-	-	-	-	-
Aeschulin	+-	-	++	-	++	-	++	+
Classification	Entero-coccus	Entero-coccus	Entero-coccus	S.Non-Haemolytious. I.	Entero-coccus	S.Saliv.	Entero-coccus	Entero-coccus
Remarks	McConkey's Growth +	McConkey's Growth +	McConkey's Growth +		McConkey's Growth +		McConkey's Growth +	McConkey's Growth +

T A B L E IV. Cont.

No. of Case	22	23		24	25		26
		R.	L.	R.	L.	R & L	
Growth on glucose Broth	Strept. Medium Chains.	Staphyl. & Strept.	Staphyl. & Strept. M. Chains.	Strept. Short Chains.	Staphyl. & Strept. L. Chains.	Strept. Long Chains.	Staphyl. & Strept. L. Chains
Growth on Blood-agar plates	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis	Do. No. Haemolysis
Growth on chocolate medium	Green	White	Green	Green	Green	Green	White
Bile Solubility	-	-	-	-	-	-	-
Heat resistance	+	-	-	+	-	-	-
Haemolysis	-	-	-	-	-	-	-
SUGAR REACTIONS							
Lactose	+	+	+	+	+	+	+
Salacine	-	+	-	-	-	-	-
Mannit	-	-	-	-	-	-	+
Inulin	-	-	-	-	-	-	-
Aesculin	+	-	-	+	-	-	-
Classification	Enterococcus	S. Mitis.	S. Saliv.	Enterococcus	S. Saliv.	S. Saliv.	S. Non-Haemolyticus I.
Remarks	McConkey's Growth +			McConkey's Growth -			

RESULTS OF ANIMAL EXPERIMENTS.

In this series only one animal was injected with streptococci obtained from one case, except in cases where the animal died early. In some cases more than one animal was employed to see, whether any lesions that were produced in the first animal, can be reproduced in the second animal. Thus 35 animals were employed in this series.

The lesions produced, along with the clinical history, the number of injections given are in the form of a table. See TABLE V.

TABLE V.

TABLE V.

SHOWING THE RESULT OF INTRA-VEINUS INJECTIONS OF STREPTOCOCCI IN RABBITS.

CASE No.	CLINICAL HISTORY	NO: OF RABBIT	NO: OF INJECTIONS	LESIONS PRODUCED		
				LOSS OF Wt.	GALL BLADDER	OTHER ORGANS
1	Suggestive of chronic cholecystitis	R1	12 Killed	+	Nil	Nil
2	No abdominal disorder. Lumbago.	R2	12 Killed	+	Chronic cholecystitis.	Nil
3	No abdominal disorder.	R3	12 Killed	+	Nil	Pneumonia. Spleen- congested.
4	No abdominal disorder	R4	12 Died	+	Nil	Nil
5	No abdominal disorder.	R5	12 Died	++	Nil	Nil
6	No abdominal disorder.	R6A	7 Died	-	Nil	Nil
		R6B	5 Died	-	Nil	Nil

7	No abdominal disorder.	R7A	1 Died	-	Patch of inflammation.	Urinary Bladder showing cystitis.
		R7B	5 Died	-	Nil	Urinary Bladder showing cystitis.
		R7C	10 Died	+	Nil	Pneumonia Pericarditis: pleurisy. No cystitis.
8	Suggestive of chronic cholecystitis	R8	10 Died	+	Nil	Nil
9	Suggestive of chronic cholecystitis	R9	6 Died	-	Nil	Nil
10	No abdominal disorder.	R10	12 Died	+	Nil	Pneumonia Pericarditis & Pleurisy.
11	No abdominal disorder.	R11	12 Died	+	Nil	Nil
12	Suggestive of chronic cholecystitis	R12	7 Died	+	Nil	Nil

TABLE V. Cont.

CASE No.	CLINICAL HISTORY	NO: OF RABBIT	NO: OF INJECTIONS	LOSS OF Wt.	LESIONS PRODUCED		
					GALL BLADDER	OTHER ORGANS	
13	Gall-stones removed at operation.	R13A	12 Killed.	+	Nil	Nil	
		R13B	12 Killed.	++	?	Nil	
14	Muscular rheumatism No abdominal disorder.	R14	12 Died	+	Nil	<u>Pneumonia</u>	
15	Suggestive of chronic cholecystitis.	R15	12 Died	+	Nil	Nil	
16	Mitral stenosis and Goitre.	R16	12 Died	+	Nil	Nil	
17	Pneumonia pleurisy, facial paralysis & Phlebitis	R17	12 Killed	++	Mucocele of the G.B. produced.	Nil	

T A B L E V. Cont.

18	No abdominal disorder.	R18	12 Died	+	Nil	Nil
19	No abdominal disorder	R19	12 Died	+	Nil	Nil
20	Suggestive of recent attacks of acute cholecystitis.	R20A	3 Killed	+	Thickened wall g. organisms seen.	<u>Pneumonia</u>
		R20B	10 Killed	+	Definite cholecystitis.	Nil
21	<u>Tooth Abscess</u> Definite history of cholecystitis	R21	8 Killed	+	Chronic cholecystitis produced.	Nil
22	Suggestive of chronic Cholecystitis	R22	9 Died	+	Nil	<u>Stomach showing haemorrhages.</u>
23	Suggestive of chronic Cholecystitis	R23A	1 Died	-	Nil	<u>Stomach distended and congested</u>
		R23B	1 Died	-	Nil	<u>Stomach- distended and congested.</u>

T A B L E. V. Cont.

CASE No.	CLINICAL HISTORY	NO: OF RABBIT	NO: OF INJECTIONS	LOSS OF Wt.	LESIONS PRODUCED	
					GALL BLADDER	OTHER ORGANS
24	Diabetes. Suggestive of chronic Cholecystitis.	R24A	1 Died	-	Nil	<u>Stomach-</u> an area of inflammation.
		R24B	4 Died	-	Nil	Nil
		R24C	2 Died	-	Nil	Pneumonia.
25	Gall-stones removed 9 years previously.	R25A	1 Died	-	Nil	<u>Stomach-</u> haemorrhages.
		R25B	6 Died	-	Nil	<u>Stomach-</u> ulcers
26	Suggestive of chronic Cholecystitis	R26	9 Died	+	Nil	Nil

SUMMARY OF THE LESIONS PRODUCED.

1. Loss of weight. Although no definite records of the weights of the animals were taken it was quite a common experience to find the healthy animal going down hill emaciating as the time went on.
2. Cholecystitis was produced in 5 rabbits. The strains of organisms were obtained from 4 cases. Two of these 4 cases had a clinical history suggestive of cholecystitis, whereas the other two cases showed no evidence of gall-bladder disease. Case No. 20 was of interest. Both the rabbits injected with this strain showed definite cholecystitis.
1 case of tooth-abscess also produced cholecystitis.
3. Cystitis. Cystitis occurred only in two animals. Both of them were inoculated with the same strain. The third animal injected with this strain, however, did not show any evidence of cystitis. I here refer to case No. 7.
4. Stomach haemorrhages and ulcers. were rather more frequent in the later part of this series. Rabbits inoculated with organisms from case No. 22, 23, one of the rabbits of case No. 24, and case No. 25.

The detailed description of these lesions is also given in the appendix. Some of them, however, are described while discussing the pathology of the lesions produced. (See Part V.)

PART II.

TONSIL PUNCTURE

TONSIL PUNCTURE.

As has been said before, it was noticed that while LUMSDEN'S technique was quite satisfactory to obtain the microflora of the parenchyma of the tonsils and the deeper crypts, there was great difficulty in interpreting the vague symptomatology. There was no definite positive evidence of the presence of gall-bladder disease in these cases, except in cases where at operation gall-bladder was found to be diseased and was therefore removed. The latter type of cases were far too few in number to allow one to draw any conclusions. It was necessary, therefore, to investigate and experiment with the organisms obtained from definite cases of cholecystitis only. This was not possible in the Ear, Nose and Throat Department of the R.I.E.

It was further difficult to get the tonsils from cases of cholecystitis who were operated upon in the surgical wards of the R.I.E. because of the following reasons. Firstly, most of these patients had no history of throat trouble. Secondly, it was difficult to persuade these patients to undergo a second operation after they had had the major abdominal/

abdominal operation done. Lastly, not being sure of the role of faucial tonsils in gall-bladder disease it was hardly fair to suggest tonsillectomy. It was, therefore, imperative to get at the micro-flora of the tonsils, in cases of gall-bladder disease, without taking the tonsils out.

The following are the other methods that could be adopted to attain the above mentioned object:-

(1) THROAT SWABS. By swabbing the tonsillar surface by means of an apparatus used for diagnosis in suspected cases of diptheria, one could obtain organisms. These are present in great abundance, and are the normal inhabitants of the tonsillar region.

The organisms that invade the general system have a long way to go from the surface of the tonsil to the lymphatics that drain the tonsil, all kinds of organisms can overcome the barrier action of the tonsil; thus it is uncertain which of the organisms ultimately get to the blood stream. The organisms from the parenchyma of the tonsil or from the deeper crypts or better still those from the retro-tonsillar lymphatic plexus were considered to be the organisms that were most likely to be the cause of disease elsewhere in the body if tonsil was the focus of/

of infection in these cases. The reason being that the organisms in these situations have passed the tonsillar barrier and are ready to enter the general lymphatic system.

It was necessary, therefore, to get organisms from these sites alone. As this could not be done by the swab method, it was not adopted.

(57)

(2) TONSIL-SUCTION. EVE described this method. He claims that this method is useful both for diagnosis and treatment of tonsillar infection. For diagnosis he uses what he calls "the diagnostic tonsil-sucker", by means of which he is able to suck out the contents of the crypts.

Although, by means of this method, one may be able to obtain the micro-flora from the deeper parts of the crypts, there is no means of excluding contamination from the tonsillar surface.

Whatever may be the value of this method for diagnosing pus in the crypts which EVE says "can be seen and smelt", this method was of no value in obtaining organisms for the purpose of present investigation.

(58)

(3) TONSIL PUNCTURE. RAMSAY & PEARCE described this method. The superficial surface of the tonsil is/

is sterilised and anaesthetised by **BONAIN'S** solution which consists of cocaine hydrochloride, menthol, and pure carbolic acid, 1 gram of each. A special all-metal syringe with guarded needle is used to puncture the tonsil. The tonsil is punctured in the "most fleshy part away from the crypts". Gentle suction, by withdrawing the piston slowly, is exerted and then the needle withdrawn. By so doing the authors hope to obtain organisms from the parenchyma of the tonsil.

This method should have been of great value for the present work if there had not been the following objections:-

(1) **BONAIN'S** solution is hardly sufficient to sterilise the surface of the tonsil.

(2) It is difficult to avoid getting into crypts. On examining several extirpated tonsils and trying to puncture by means of a hypodermic needle, I found that every time I punctured I got into a crypt, as was shown by the return of the fluid through the crypt on to the surface.

(3) **DR. MARTIN**, on two occasions, tried this procedure for me. On both these occasions, in addition to a non-haemolytic streptococcus, I obtained profuse growth of staphylococcus, micrococcus catarrhalis and micrococcus tetragenous. This was necessarily/

necessarily the result of superficial crypt and surface contamination.

This procedure was thus found unsatisfactory for the present work, and was, therefore, not adopted.

A NEW METHOD OF TONSIL PUNCTURE.

It was considered that if the organisms enter the general system via the lymphatics, when the tonsil is focus of infection, then by getting at the rich plexus of lymphatics in the retro-tonsillar space one might be able to obtain the responsible organisms.

Dr. HALL of the Ear, Nose and Throat department of the R.I.E., carried out several experiments for me. After trying several methods he was able to evolve a new technique, by means of which, we were able to obtain the organisms from the retro-tonsillar lymphatic plexus which drains the tonsil.

By this method we are able to avoid superficial contamination, and also the crypt contamination.

Further, the organisms obtained are presumably those that have passed the tonsil barrier and are entering the general system through the lymphatics.

To avoid the superficial contamination the puncture is performed through the anterior pillar, which is comparatively much less contaminated than the/
the/

the surface of the tonsil itself. Further, the anterior pillar is swabbed with a dry swab and then with spirit.

In the earlier ones pure carbolic acid was also used, but to simplify the technique we gave it up. This, however, did not make any difference in our results.

For want of a better name, I propose to call this procedure by the name of "Tonsil Puncture" although, in this method the tonsil is not punctured at all.

TECHNIQUE OF TONSIL PUNCTURE.

(a) Apparatus required - An all-metal tonsil injecting syringe, Fig. 12 tongue depressor, "bubbles" a volsellum, 20% solution of cocaine, methylated spirit, some sterile saline, test tubes containing 1% glucose broth.

(b) Procedure -

I. The operator, wearing a head mirror, sits facing the patient and a suitable light is reflected on to the mirror from a lamp behind the patient's head. The tongue depressor is inserted and the tonsils examined. When the patient is not under a general anaesthetic, a self-retaining tongue depressor is most/

the surface of the tonsil itself. Further, the anterior pillar is swabbed with a dry swab and then with spirit.

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(b) Procedure -

I. The operator, wearing a head mirror, sits facing the patient and a suitable light is reflected on to the mirror from a lamp behind the patient's head. The tongue depressor is inserted and the tonsils examined. When the patient is not under a general anaesthetic, a self-retaining tongue depressor is most/

most useful. The pillars of the tonsils and the medial surface of the tonsils are painted with 20% cocaine. After a few minutes one anterior pillar is sterilised by rubbing with a dry swab, and then with spirit. The tonsil is grasped by means of a volsellum, and a very slight degree of traction is applied. A few ccs. of saline are drawn into the tonsil syringe which has already been sterilised by boiling. The needle is pushed through the anterior pillar and is first directed outwards, to avoid puncturing the tonsil, and then forwards into the retro-tonsillar space. To make sure that you are not in the tonsil itself, apply a slight traction to the tonsil, and if your needle is not in the tonsil you get a peculiar feel. A small quantity of saline is injected, and then sucked back into the syringe. The syringe is then withdrawn, taking care not to touch any structure in the mouth. Five or six drops of the contents of the syringe are transferred to the glucose broth in the test tube. The tube is properly marked and incubated for 18 to 72 hours. A smear from the culture is then stained with Gram stain and microscoped and classified as detailed elsewhere.

(see Bacteriology of tonsils)

2./

2. The above procedure had to be modified in cases where tonsil puncture was performed immediately after an operation when the patient was still under the general anaesthetic.

Patient lies on the operating table. A suitable light is adjusted so as to light the face. A gag is inserted and the mouth fully opened. The tongue is then depressed by a tongue depressor. The anterior pillar is swabbed, first with a dry swab and then with spirit. An assistant holds the tongue depressor and the operator grasps the tonsil by a volsellum as described above. The needle is then pushed into the retro-tonsillar space as described above.

In order to compare the organisms obtained from extirpated tonsils by LUMSDEN'S technique and those by tonsil puncture, in the same case the following procedure was adopted.

A series of 20 cases were taken. All were cases where the tonsils were definitely diseased. All the patients were more than 20 years of age. None of them had any history of abdominal disturbance of any kind. Most of the cases had recurrent attacks of tonsillitis.

Before/

Before removing the tonsils, by the usual method of dissection of the tonsil under a local anaesthetic, tonsil puncture was performed in the manner indicated above. The extirpated tonsils were dealt with in the manner described by LUMSDEN. The organisms obtained in both cases were identified and classified in the usual manner. The results are shown in the accompanying table. (See TABLE VI.)

It will be noticed from the Table that no growth of organisms was obtained in three cases of tonsil puncture, whereas the corresponding tonsils gave a growth of non-haemolytic streptococci. On 3 more occasions the growths obtained were not identical.

In 14 cases out of 20, however, the organisms obtained from extirpated tonsils and by tonsil puncture were identical.

TABLE VI/

T A B L E. VI.
COMPARING ORGANISM OBTAINED BY TONSIL PUNCTURE AND FROM EXTIRPATED TONSILS.

No of Specimen	1	2	3	4	5	6	7
	T. T.P.	T. T.P.	T. T.P.	T. T.P.	T. T.P.	T. T.P.	T. T.P.
Growth on glucose broth	Staphyl. Strept.	Strept.	Strept. Strept.	Strept. Strept.	Strept.	Strept.	Strept. Strept.
Growth on Blood plates	Do. No Haemolysis	Do No Haemolysis	Do No Haemolysis	Do No Haemolysis	Do No Haemolysis	Do No Haemolysis	Do No Haemolysis
Growth on chocolate medium	Green	Green	Green	Green	Green	White	White
SUGAR FERMENTATION							
Lactose	++	+	+	+	+	+	+
Salacine	+++	+++	+++	+++	+++	+++	+++
Mannit	+++	+++	+++	+++	+++	+++	+++
Inulin	+++	+++	+++	+++	+++	+++	+++
Aesculin	+++	+++	+++	+++	+++	+++	+++
Bile Solubility	+	+	+	+	+	+	+
Heat resistance	+	+	+	+	+	+	+
Name of the Strain.	S. Mitts.	S. Saliv.	S. Saliv.	S. Saliv.	S. Saliv.	S. Mitts	S. Saliv.

TABLE VI. Cont.

No of Specimen	8	9	10.	11	12	13	14
Growth on glucose broth	T. Strep. & Staph.	T. Strep. & Staph.	T. Strep.	T. Strep.	T. Strep. & Staph.	T. Strep.	T. Strep.
Growth on Blood plates	Do No	Do No.	Do No.	Do No.	Do No.	Do No.	Do No.
Growth on chocolate medium	Haemolysis	Haemolysis	Haemolysis	Haemolysis	Haemolysis	Haemolysis	Haemolysis
SUGAR FERMENTATION	Green	White	Green	White	Green	Green	White
Lactose	+	++	++	++	+	+	++
Salacine	+	+	+	+	+	+	+
Mannit	+	+	+	+	+	+	+
Inulin	+	+	+	+	+	+	+
Aeschulin	+	+	+	+	+	+	+
Bile Solubility	-	-	-	-	-	-	-
Heat resistance	-	-	-	-	-	-	-
Name of the Strain.	S. Saliv.	S. Mitts	S. equines.	S. Mitts.	S. Saliv.	S. Saliv.	S. Mitts

TABLE VI. Cont.

No of Specimen	15		16		17		18		19		20	
	T.	T.P.	T.	T.P.	T.	T.P.	T.	T.P.	T.	T.P.	T.	T.P.
Growth on glucose broth	Strept.		Staph. & Strept.	Strept.	Staph. & Strept.	Strept	Strept.	Strept.	Strept. & Staph.	Strept.	Strept. & Staph.	Strept.
Growth on Blood plates	Do	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.
Growth on chocolate medium	Green	Green	Green	White	White	White	Green	Green	White	White	Green	Green
SUGAR												
FERMENTATION												
Lactose	+	+	+	+	+	+	+	+	+	+	+	+
Salacine	+	+	+	+	+	+	+	+	+	+	+	+
Mannit	+	+	+	+	+	+	+	+	+	+	+	+
Inulin	+	+	+	+	+	+	+	+	+	+	+	+
Aeschulin	+	+	+	+	+	+	+	+	+	+	+	+
Bile Solubility	+	+	+	+	+	+	+	+	+	+	+	+
Heat resistance	+	+	+	+	+	+	+	+	+	+	+	+
Name of the Strain.	S.Saliv	S.Saliv.	S.Saliv.	S.Mitts.	S.non-Haemolysis I.	S. Mitts	S.Saliv.	S. Saliv.	S.Mitts.	S.Mitts.	Intero-coccus	Intero-coccus

C O N C L U S I O N S .

1. The new method of "Tonsil Puncture" has been described. The method is simple and can be carried out by any medical practitioner.
2. By Tonsil Puncture one can obtain the organisms that have passed the tonsil barrier and are ready to enter the general lymphatic system.
3. By means of this method the crypt contamination was excluded.
4. By this method investigation of the micro-flora of the tonsils, of definite cases of gall-bladder disease, was made possible.

USES OF THE TONSIL PUNCTURE.

It is difficult to say definitely how much this method will be of value in future. Besides the experimental investigations similar to the present one, this method of tonsil puncture may be employed with advantage under the following set of circumstances.

1. The physician is often confronted with the difficulty of finding out the focus of infection in cases of fibrositis, arthritis, neuritis, etc., in fact all kinds of diseased conditions ranging from simple skin eruptions to psychosis and psychoneuroses. The tonsils have a very peculiar way of hiding the infection in them; it is for this reason that many tonsils are removed. By the method of tonsil puncture, one can definitely say whether or not a tonsil is supplying the individual with micro-organisms.

In cases of negative tonsil puncture the physician should refrain from advising tonsillectomy and should look for the site of focal infection elsewhere.

2. In young individuals where the tonsils are hypertrophied, and there is a tendency to recurrent attacks of tonsillitis, and where the tonsil puncture/

puncture is negative , I should be inclined to employ other means of treating the local condition like **EVE'S** suction method, rather than advise tonsillectomy which can easily be delayed.

A SHORT NOTE ON DEFINITE CASES
OF CHOLECYSTITIS INVESTIGATED BY
TONSIL PUNCTURE.

In the course of the present investigation 14 definite cases of chronic cholecystitis were investigated. The cases were taken from Professor WILKIE'S wards at the Royal Infirmary Edinburgh.

In all cases I examined the patients and went into their clinical history including the history of the tonsils and teeth, and physical examination.

At operation the state of the gall-bladder and other viscera was noted. Tonsil puncture was performed only when the gall-bladder was diseased. It was performed while the patient was under the general anaesthetic. In cases where the gall-bladder was removed, it was examined histologically to confirm the naked eye findings.

The accompanying table gives the bacteriology of tonsil puncture in these 14 cases. (See TABLE VII.)

A/

A note was also taken of results of the growth obtained from the cystic lymph gland, the gall-bladder wall and the bile. This is done as a routine in the laboratory.

Records of clinical history, physical examination and Bacteriological findings are given in the appendix to this thesis.

No. of Case.	8	9	10	11	12	13	14
Growth on glucose broth	Delayed Strep. s. chains	Delayed Strep. & Staphyl. s. chain	Profuse Strep. L. & S. chains	Profuse Strep. Staphyl. L. chains		Profuse Strep. L. & S. chains	
Growth on blood-plates	pure no Haemolysis	mixed no Haemolysis	B. coli & Strep.	mixed no Haemolysis		pure no Haemolysis	
Growth on chocolate medium	Green	Green		White		Green	
Bile solubility	-	-	-	-	Growth	-	Growth
Heat resistance	+	-		-		-	
Haemolytic test	-	-		-		-	
SUGAR REACTIONS							
Lactose	-	+		+		+	No
Mannit	-	-		-		+	
Salacin	-	-		+		+	
Inulin	-	-		-		-	
Aeschulin	+	-		-		-	
Classification	Enterococcus No growth on McConkey's medium	S. saliv.	Organisms could not be separated.	S. mitis		S. mitis	
Remarks							

No. of Case.	8	9	10	11	12	13	14
Growth on glucose broth	Delayed Strep. s. chains	Delayed Strep. & Staphyl. s. chain mixed no	Profuse Strep. L. & S. chains B. coli & Strep.	Profuse Strep. Staphyl. L. chains mixed no	---	Profuse Strep. L. & S. chains pure no	---
Growth on blood-plates	pure no	Haemolysis	Haemolysis	Haemolysis	---	Haemolysis	---
Growth on chocolate medium	Green	Green	'	White	---	Green	---
Bile solubility	-	-	Organisms could not be separated.	-	Growth	-	Growth
Heat resistance	+	-		-		-	
Haemolytic test	-	-		-		-	
SUGAR REACTIONS							
Lactose	-	+		+	No	+	No
Mannit	-	-		-		-	
Selacin	-	-		+		+	
Inulin	-	-		-		-	
Aeschulin	+	-		-		-	
Classification	Enterococcus No growth on McConkey's medium	S. saliv.	Organisms could not be separated.	S. mitis		S. mitis	
Remarks							

ANIMAL EXPERIMENTS WITH NON-HAEMOLYTIC
STREPTOCOCCI OBTAINED BY
TONSIL PUNCTURE IN DEFINITE CASES OF
CHOLECYSTITIS.

In this series three rabbits were employed for injection purposes in each strain. It was noticed in the previous series that the resistance of the animal and its reaction to the injection of organisms varied considerably in different individual rabbits, depending more on the animal than the invading organisms. To exclude this factor 3 rabbits were inoculated with the same strain, at the same time, and under similar conditions.

Thus 33 rabbits were employed for 11 cases in which non-haemolytic streptococci were obtained.

The technique of injections, dosage and post mortem examination etc. were the same as in the first series.

In addition the question of examination of joints was also taken in view. The knee and elbow joints of all these animals were examined.

For convenience, the results of animal inoculation/

inoculation are tabulated in the accompanying table.

(See TABLE IX)

TABLE IX/

T A B L E. IX.

RESULTS OF INTRA-VEINUS INJECTIONS OF NON-HAEMOLYTIC
STREPTOCOCCI IN RABBITS.

CASE No.	NAME of PATIENT	NO: OF RABBIT	NO: OF INJECTIONS	LOSS OF Wt.	LESIONS PRODUCED		
					GALL-BLADDER	OTHER ORGANS	
1	Mrs Ross	R36	6 Died	++	Nil	Nil	Nil
		R37	1 Died	-	Nil	<u>Pneumonia</u>	
		R38	3 Died	-	Nil	Nil	Nil
		R39	5 Died	+	Nil	Stomach Hæ- morrhages & ear- ly ulcer for- mation. Kidney. L. small cell infiltra- tion.	
2	Mrs Jenkins	R40	2 Died	-	Nil	Nil	Nil
		R41	1 Died	-	Nil	Pneumonia.	

3	Mrs Woodburn.	R42	2 Died	-	Nil	Nil
		R43	10 Died	++	Nil	Nil
		R44	2 Died	-	Nil	Stomach, ulcers Kidneys, Abscesses.
4	Mrs Cameron.	R45	7 Died	+	Nil	Nil
		R46	9 Died	++	Nil	Nil
		R47	6 Died	+	Nil	Nil
5	Mrs Barr.	R48	8 Died	++	Nil	Nil
		R49	7 Died	+	Nil	Pneumonia.
		R50	9 Died	++	Nil	Nil
6	Mr Perman.	R51	9 Died	+	Nil	Nil
		R52	5 Died	+	Nil	Nil
		R53	9 Died	+	Nil	Nil

T A B L E. IX. Cont.

CASE No.	NAME of PATIENT	NO: OF RABBIT	NO: OF INJECTIONS	LOSS OF Wt.	LESIONS PRODUCED		
					GALL-BLADDER	OTHER ORGANS	
7	Mrs Edmonston	R54	8 Died	++	N.E.opaque No cellular infiltration. Contents - <u>B.coli</u> & Strp.	<u>Kidneys</u> . Small cell infiltration.	
		R55	8 Died	+	Nil	<u>Stomach</u> . Haemorrhages.	
		R56	8 Died	+	Nil	Nil	
		R57	8 Died	+	Nil	Nil	
8	Mrs Speedie.	R58	8 Died	+	Nil	<u>Left knee</u> . pus Staphyl. and Strept obtained.	
		R59	8 Died	+	Nil	Nil	
		R60	8 Killed	+	Nil	Nil	
9	Mrs Murray.	R61	8 Killed	++	Nil	<u>Kidney</u> . Abscesses	
		R62	3 Died	-	Nil	Pneumonia.	

T A B L E. IX. Cont.

11	Mrs Duffey.	R63	⁷ Killed	+	Nil	Nil
		R64	⁷ Killed	+	Nil	Nil
		R65	⁷ Killed	+	Nil	Nil
13	Mrs Taylor.	R66	⁹ Killed	+	Nil	Nil
		R67	⁹ Killed	+	Nil	Nil
		R68	⁶ Killed	+	Nil	Nil

SUMMARY OF THE LESIONS PRODUCED.

1. Loss of weight. In this series, as in the last, the loss of weight was a marked feature. The loss of weight seemed to correspond with the number of injections i.e. the more the number of injections the greater the loss of weight.
2. Cholecystitis. Occurred in no case. In case No. 7, R54, the gall-bladder looked thickened. On section no evidence of inflammation was present. From the contents of the rabbit's gall-bladder *B. coli* and a ~~streptococcus~~ streptococcus was obtained, but these could not be separated, and thus the streptococcus could not be identified.
3. Kidney Abscesses. Occurred in 4 rabbits out of the 33 animals employed in this series.
4. Stomach haemorrhages and ulcers. Occurred in 3 rabbits. In R39, 44, 55.
5. Joint Lesions. The left knee of R58 showed involvement. Non-haemolytic streptococci identical with those injected were recovered from the joint.
6. Pneumonia. Killed only 4 rabbits.

The detailed description of these lesions is given in the appendix. Also see the pathology of the lesions produced. (PART V.)

PART III.

TONSIL INJECTION WITH STREPTOCOCCI,

DIRECT TONSIL INJECTION WITH STREPTOCOCCI.

It has been shown sufficiently that the tonsils, during an acute attack of tonsillitis, supply micro-organisms to the blood stream. Also, once the tonsil has become chronically inflamed, it feeds the blood-stream by emboli of bacteria, in addition to those that gain entrance through large lymph channels in the tonsil.

If ROSENOW'S hypothesis is correct, and therefore, if certain strains of streptococci have special affinity for certain tissues of the body more than others, then it is quite reasonable to expect that several acute attacks of tonsillitis, caused by a specific strain of streptococcus, should supply organisms to general circulation and result in localisation of those organisms in a particular organ.

It is argued that, when a patient's tonsil contains organisms that have affinity for gall-bladder he is liable to supply these organisms to the general circulation. Once these organisms get into the general circulation, they are taken to all the organs of the body, but for some unknown reason, they prefer to settle down in a particular organ. The localisation entirely depending on some inherent quality of the organisms/

organisms and not on the state of the tissues of the body of the host. If this hypothesis is correct, then one should be able to produce various lesions at will by producing tonsillitis with different strains of streptococci, which have affinity for different organs in the body. For example, if an organism has affinity for the gall-bladder, and if tonsillitis is caused by this organism in an experimental animal, then it ought to pass into general circulation and ultimately localise in the gall-bladder of the animal. Similarly, if the organisms have affinity for the stomach wall, appendix or aortic cusps, then they should localise in the stomach wall, appendix and aortic cusps respectively.

Working on the above mentioned hypothesis, I attempted to produce acute tonsillitis by injecting concentrated suspensions of organisms directly into the tonsils of two dogs.

First of all I studied the anatomy of the faucial tonsils in the experimental animals. I found that the tonsils of the dog were very like the human and were very suitable for injecting purposes. The accompanying micro-photograph No. 14, gives the histological structure of the tonsil of a dog under normal conditions, i.e. without the tonsil being injected.

It/

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It/

It is covered with stratified epithelium which is continuous with the epithelium lining the crypts. The crypts are not so numerous. The mucoserous glands which occurs in nearly all the mammalian tonsils, are least developed in man, whereas in the dog, they are well developed and are entirely covered over by the lymphoid tissue of the tonsil proper. The germ centres etc. require no special description.

THE ORGANISMS USED.

Two strains of streptococci which were obtained from the gall-bladder wall or the cystic lymph gland of a case of chronic cholecystitis, were employed. Both were non-haemolytic streptococci. The following table gives other characteristics of the organisms.

T A B L E.

PATIENT	GROWTH ON CLUCOSE	GROWTH ON CHO- COLATE	BILE SOLU- BILITY	Sugar fermentation			
				Lac.	Man.	Sal.	Aesc.
THOMSON	short chains	Green	-	-	-	-	+
HUNTER	long chains	White	-	+	-	+	-

Both/

Both the strains did not ferment Inulin. The first one resisted heat at 60°C for 20 minutes. But did not grow on **MacCONKEY'S** medium.

Technique for injecting the tonsils.

The organisms were kept alive in chocolate medium. Fresh cultures were employed every time for injections. 20 to 24 hrs. cultures on 1% glucose broth were employed.

The animal(dog) is anaesthetised with ether anaesthesia and is laid on its back. The mouth is opened as wide as possible by means of a gag and the tongue is held by a tongue forceps. Suitable light is reflected onto the fauces. The tonsils are then exposed by pulling aside a fold of mucous membrane which covers it medially. The tonsils are then swabbed by a dry swab to remove the mucous and salivary secretions.

By means of a fine needle and a long syringe $\frac{1}{2}$ cc. of a concentrated suspension of organisms is injected into the substance of the tonsil at various places. A few drops being sprayed on to the surface of the tonsil. The tongue is then released and the gag removed.

By the procedure described above, I was able to produce tonsillitis in both the dogs that I employed/

ed for this experiment

Dog No:1 and 2 were injected as follows:-

15.10.29.	1 cc. of suspension of organisms in saline.	
22.10.29.	"	"
28.10.29.	"	"
5.11.29.	"	"
12.11.29.	"	"
18.11.29.	"	"
25.11.29.	"	"
1.12.29.	"	"

In all 8 injections were given over a period of nearly 2 months.

On 4.12.29. the animals were operated upon and under all aseptic conditions their gall-bladders were removed. At operation both the gall-bladders were perfectly normal in appearance. On attempting to grow organisms from the wall or the bile inside them, it was found that they were sterile.

Sections of the gall-bladders were taken. (i) H. & E. showed a perfectly normal mucous membrane. There was no thickening of the wall and no cellular infiltration.

(ii) Gram. showed no organisms.

Both the dogs were killed later. They showed no pathological changes in any of the other organs.

The tonsils however, were definitely diseased. They were hypertrophied (nearly twice the size of the normal). They were congested. There was/

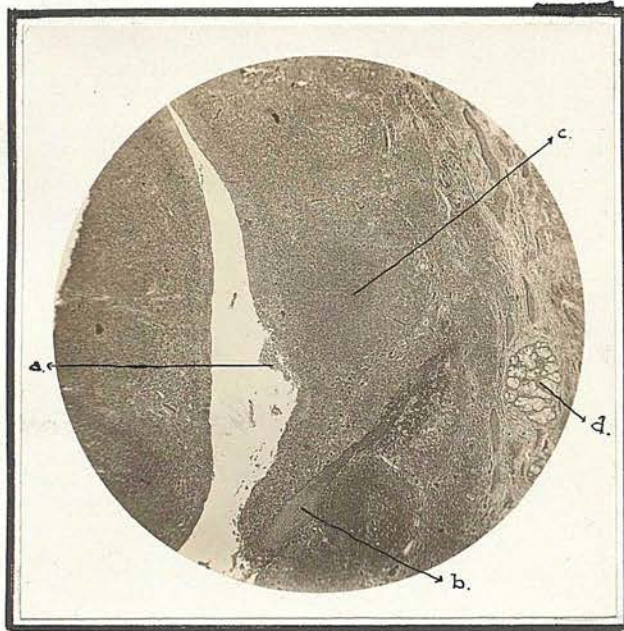


Fig. 15. Dog's Tonsil. Low power view.
Showing subacute tonsillitis.

- a. Tonsillar crypt with broken down epithelium, and containing cellular debris.
- b. Extreme congestion. Dilated blood-vessels.
- c. Area of cellular hyperplasia.
- d. Mucous gland.

was no gross pus formation on the surface, as one often sees in the human septic tonsils. Evidently these tonsils had not reached that stage.

Tonsil puncture was performed on dog No.2 before removing the tonsils for sectioning. The needle was pushed directly into the tonsil substance. A profuse growth was obtained in 36 hrs. It was a pure culture of *S. mitis*. From the description of the organisms used for injection one could see that the organisms that were injected in dog No. 2 were also *S. mitis*.

The tonsils of both the dogs were removed after death, and examined microscopically. They showed a picture which was identical with the one I tried to describe under "pathological changes in chronic tonsillitis". See **PART I**. The chief features were:-

- (i) Marked congestion of the organ.
- (ii) Hyperplasia of the lymphoid tissue.
- (iii) Destruction of the epithelium of the crypts and presence of epithelial debris in the crypts.
- (iv) There was no increase of fibrous tissue either of the capsule or of the stroma.

Fig. 15 shows the histology of a dog's tonsil in the abnormal state. It shows all the essential features of the chronic tonsillitis detailed above.

CONCLUSIONS.

1. In the dog the tonsils are very suitable for injecting purposes.
2. It is possible to produce acute tonsillitis leading later to a progressive chronic tonsillitis in the dog, by direct injection with non-haemolytic streptococci.
3. The organisms obtained from the gall-bladder of a case of chronic cholecystitis, when injected into the tonsils of a dog produced tonsillitis, but did not produce any changes in the gall-bladder of the animal. No other organs were affected.
4. A specific organism that had caused tonsillitis did not, when injected intravenously, show any tendency to localisation in any particular organ.

PART IV.

EFFECT of TRAUMA and STREPTOCOCCAL INJECTIONS.

EFFECT OF TRAUMA AND STREPTOCOCCAL INJECTIONS.

Mere intravenous injections of non-haemolytic streptococci did not produce, in appreciable number of cases, any lesions in the gall-bladder of a healthy rabbit; the streptococci being obtained from tonsils of cases of chronic cholecystitis, either directly from extirpated tonsils or by means of the new method of tonsil puncture. The resistance of the animal seemed to be very high against the invasion of micro-organisms as was shown by the lack of lesions produced in many cases.

(5)

Although, **ROSENOW** maintains that even small doses of organisms are enough to show their property of elective localisation, there was no evidence in the present work to support his theory. Repeated injections of fairly large doses over a long period failed to produce any lesions in the gall-bladder.

Professor WILKIE then suggested a set of experiments. The object of these experiments was to see -

- (1) Whether lowering the resistance of an organ, by traumatising/

traumatising it, enables the streptococci to settle in that particular organ;

- (ii) Whether specific streptococci show any greater tendency to settle in a particular organ more than another organ, which is under a similar state of lowered resistance.

Two organs were selected, the gall-bladder and the lesser curvature of the stomach.

Eleven rabbits in all were used for this experiment. Three series of experiments were done. In all cases laparotomy was performed on the animals under perfectly aseptic conditions. The gall-bladder was exposed and traumatised and so also the lesser curvature of the stomach. The degree of trauma varied as will be described below. A few days were allowed for the animal to recover from the operation.

ORGANISMS used were obtained from three different types of cases:-

- (i) From the wall of the gall-bladder or cystic lymph gland of a case of chronic cholecystitis.
- (ii) By tonsil puncture from the tonsils of a definite case of chronic cholecystitis.
- (iii) From extirpated tonsils of a case of chronic tonsillitis where no history of any abdominal disturbance was present.

These organisms were kept alive on chocolate medium. 20 to 24 hours cultures on glucose broth were centrifuged and suspended in normal saline and/

and then used for injections.

The injections were given at weekly intervals in small doses. In series 2 and 3 the organisms used were the same.

TRAUMA. The degree of trauma varied.

In the first series of 4 rabbits trauma of the gall-bladder was produced by rubbing the walls with gloved finger and thumb and injecting a drop or two of liquid paraffin into the neck of the gall-bladder after injection of normal saline. The lesser curvature of the stomach was traumatised by injecting liquid paraffin into the wall of the stomach, along the lesser curvature.

In the second series no liquid paraffin was used. Only saline was injected. The rest of the procedure was the same as in series No.1. A set of 4 rabbits was used again.

In the third series only three rabbits were used. The trauma applied was the same as in series 2.

The following tables give a summary of the lesions produced.

TABLE/ 10, 11, 12.

T A B L E X.

SERIES NO. ILaparotomy -
12.12.29.

1. Traumatized gall-bladder and injected saline and liquid paraffine.
 2. Injected liquid paraffine into the lesser curvature of the stomach.
- Injections started 6 days after the operation.

Rabbit No.	Streptococcus used.	No. of injections.	Lesions produced.	
			Lesser curvature	other organs
I Control	Nil	Nil	Nil	Nil
II	Strep. from wall of the gall-bladder. Enterococcus (Mrs Thomson.)	1 died 3 days later	Nil	Wall not thickened No cellul- lar infiltration.
III	Strep. from the tonsils (T.P.). of a cases of cholecystitis (Mrs Ross) S. Salivarius	2 died a day later	Nil	Wall thick- ened. Small cell infiltration Defi- nite Cholecystitis
IV	Strep. from the tonsils Patient with no abdom- inal lesion. (S. Salivarius)	2 died a day later	Nil	Wall not thickened No cholecy- stitis produced.
				Stomach-ulcers and haemorrhages. Kidney Abscesses.

SERIES NO. II Laparotomy -

1. Traumatised gall-bladder and injected saline along the neck of the organ.
2. Injected saline along the lesser curvature of the stomach into the wall. Injections started 14 days after the operation.

Rabbit No.	Streptococcus used.	No. of injections	Lesions produced.	
			Lesser curvature	Gall-bladder Other organs
I control	Nil	Nil	Nil	Nil
II	Strep. from the gall-bladder wall. (Enterococcus) (Mrs Thomson)	1 died 6 days later	Nil	Wall not thickened. No cellular infiltration <u>No cholecystitis</u> Kidney abscesses. Spleen large and congested.
III	Strep. from the tonsils (T.P.) of a case of cholecystitis (Mrs Taylor) S. Mittis.	2 died 2 days later	Nil	Wall not thickened. No cellular infiltration <u>No cholecystitis</u> Lungs - Pneumonia Heart. endocarditis Spleen congested
IV	Strep. from the tonsils. Patient with no abdominal lesion. (S. salivarius)	1 died 7 days later	Nil	Wall not thickened. No cellular infiltration <u>No cholecystitis</u> Kidneys (both) abscesses. Stomach. area of acute inflammation.

SERIES NO. III.

Laparotomy - 1. Traumatized gall-bladder and injected saline along the neck of the organ.
 18. 1.30. 2. Injected saline along the lesser curvature of the stomach into the wall.
 Injections started 3 days after the operation.

Rabbit No.	Streptococcus used.	No. of injections	Lesions produced.	
			Lesser Curvature	Other organs.
I	Strep. from the gall-bladder wall (Enterococcus) (Mrs Thomson)	3 died 6 days later	Nil	Kidneys. Both showing abscesses Stomach Haemorrhages.
II	Strep. from a case of cholecystitis obtained by tonsil puncture. (S. Mitis) Mrs Taylor.	5 killed 4 days after last injection.	Nil	Kidneys. Both showing minute abscesses.
III	Strep. from the tonsils. Patient with no abdominal disorder. (S. salivarius)	5 killed 4 days after last injection.	Nil	Nil

In order to determine the effect of trauma on the gall-bladder alone I carried out the following experiments. Rabbits alone were used in this series. Trauma applied varied in degree. A series of three rabbits were taken.

Rabbit No. 1. The gall-bladder was exposed and handled with a gloved finger and thumb. The walls were made to gently rub against each other.

Rabbit No. 2. The gall-bladder was handled as in the case of rabbit No. 1, but in addition a small quantity of sterile saline was injected into the wall of the gall-bladder.

Rabbit No. 3. The cystic duct was exposed. A ligature was passed round it, and then removed without tying it. This process involved a certain amount of handling of the gall-bladder also.

All the animals were taken from a healthy stock. They were operated upon under perfectly aseptic conditions. No injections of organisms were given. The animals were allowed to live for more than a month.

On post mortem examination the gall-bladder showed no indication of disease. All the gall-bladders were sectioned.

SUMMARY/

SUMMARY OF RESULTS.

1. The control rabbits in series 1 and 2 showed no changes in the gall-bladder or any other organ.
2. The lesions produced in various organs with the same organisms varied considerably.
3. Disease of the gall-bladder was produced only in two cases. The strain of streptococcus that localised in the gall-bladder in series 3 did not do so in series 2.
4. In six rabbits out of 9 injected with non-haemolytic streptococcus, abscesses of the kidney occurred. This lesion was not commonly found in the other series. Lowering of the general resistance of the animal after a laparotomy seem to make the kidneys very susceptible to infection.
5. Endocarditis occurred in one rabbit. The same strain of organisms when injected under similar conditions into another rabbit i.e. in the 3rd series, failed to produce any lesions of the endocardium of the rabbit's heart.
6. In no case did the organisms localise in the lesser curvature of the stomach.

RECOVERY OF ORGANISMS FROM THE KIDNEY ABSCESSSES.

Attempts were made to isolate the organism. In two cases *B. coli* was present in addition to a streptococcus. It was found difficult to separate these organisms.

On two other occasions a pure growth of non-haemolytic/

haemolytic streptococcus was obtained. These organisms were identical with the type of streptococcus injected.

No experiments of injections with these organisms were carried out.

C O N C L U S I O N S .

1. The organisms obtained from tonsils of cases of gall-bladder disease or from the gall-bladder wall itself, did not show any affinity for the gall-bladder in spite of the lowered resistance of the organ.
2. The organisms of the tonsils when injected intravenously showed no special affinity for any particular organ.
3. The kidneys appeared to be most liable to infection, when the general resistance of the animal was lowered by operation.
4. Trauma alone, i.e. in the absence of organisms does not produce any disease in the gall-bladder.

PART V.

NOTES on the PATHOLOGY of the LESIONS PRODUCED.

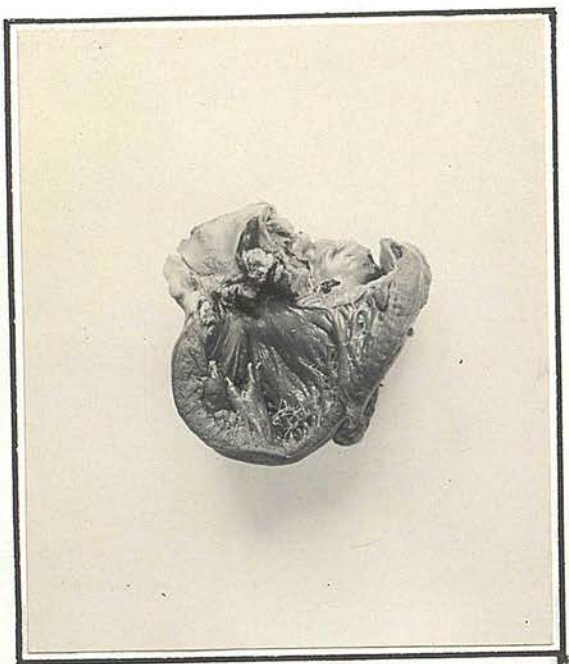


Fig. 16. Rabbit's Heart.
Showing marked vegetations on
the aortic valves.



Fig. 17. Section of the aortic valve.
Showing vegetations.
a. Heart muscle.
b. Cusp.
c. Vegetation.

NOTES ON THE PATHOLOGY OF THE LESIONS PRODUCED.

1. ENDOCARDITIS.

Out of 85 animals (rabbits) employed in the present investigation only one showed endocardial lesions. In this case the animal had marked vegetations on the aortic valves. All the other valves were normal. The accompanying photograph shows the lesions well. (See FIG. 16). An enlargement of the same specimen is also shown. (See FIG. 18).

The sections of the aortic valves showed typical pathological changes. The Gram stained sections revealed clumps of Gram positive organisms. (See micro-photograph 17).

The lesion was produced in a rabbit which had previously been operated upon and in which the gall-bladder and the lesser curvature of the stomach had been traumatised. (See PART IV/ Experimental Series II.)

The organisms employed for injections were obtained by tonsil puncture from a case of cholecystitis. The organisms were non-haemolytic, produced green on the chocolate medium and only fermented lactose/

lactose and salacin. They did not ferment aesculin and were not heat resistant.

The same strain was employed in Series III, **PART IV** in a rabbit which had been similarly treated to the one mentioned above. No endocardial lesions occurred.

The same strain was injected into three rabbits intra-venously. These animals were not interfered with in any way. In no case did endocarditis occur again. (See **TABLE 9**)

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The same strain was injected into three rabbits intra-venously. These animals were not interfered with in any way. In no case did endocarditis occur again. (See **TABLE 9**)

NOTES on the LITERATURE on EXPERIMENTAL
ENDOCARDITIS.

Early workers found that they were unable to produce endocarditis without impairing the vitality of the cusps before the injection of micro-organisms.

As early as 1886 WYSSOKOWITSCH⁽⁵⁹⁾ and ORTH⁽⁶⁰⁾ carried out experiments in order to produce endocarditis. They found that an intra-venous injection of organisms alone could not produce endocardial lesions. Where as if pulverised charcoal was added along with staphylococci or streptococci endocarditis could be produced.

RIBBERT⁽⁶¹⁾ (in 1886) produced endocarditis in rabbits by intra-venous injections of emulsions of potato particles and staphylococci, and showed that endocarditis was due, at least in some cases, to implantation.

DRESCHFELD⁽⁶²⁾ in 1887, was the first in this country to produce endocarditis by injecting streptococci alone. He obtained streptococci in pure culture from a case of endocarditis. Injection of these organisms, diluted in beef-tea, into the jugular vein of a rabbit, without previous injury of the aortic valves, produced most extensive and marked vegetations on/

on the mitral and aortic valves, in which the same streptococcus was found.

Among more recent workers **SHAW**⁽⁶³⁾ in 1904, was able to produce various lesions in animals by intravenous injections of micro-organisms alone. Arthritis, endocarditis, myocarditis, pericarditis, pleurisy and iritis were the lesions produced. He showed that these particular organisms were specific in as far as they showed predilection to the particular organs in the body.

LIBMAN AND CELLAR,⁽⁶⁴⁾ in 1910, injected "S. Viridans" intravenously in rabbits and produced peritonitis and endocarditis in several cases. They however failed to show any predilection on the part of these organisms to any particular organs.

ROSENOW⁽⁶⁵⁾ in 1912, experimenting with pure cultures of cocci isolated from cases of chronic infective endocarditis obtained 5 strains which were isolated from the blood, and 2 from the tonsils of cases of sub-acute or chronic infective endocarditis. These organisms produced green on blood agar plates, and fermented inulin at one time or another. Exceedingly large doses were given to kill the rabbits within 24 hours. In all cases he observed haemorrhages occurring at the apex of the papillary muscles and/

and the base of the tri-cuspid valves. Definite lesions being produced in 84% of the injected rabbits. The same technique failed to produce endocarditis in guinea-pigs, because of the absence of blood-supply in the valves of the animal. Discussing the pathology of endocarditis ROSENOW says, "The endocarditis, in the rabbits which follow injections of cocci, is due to an embolic process. There is produced first, valvular haemorrhages from which the vegetations develop. The organisms being protected owing to the avascularity of the valve structure". ROSENOW (66) showed that these organisms were specific and that they were modified pneumococci.

(67)
HENRICI in 1916, found that 9% of the rabbits inoculated with non-haemolytic strains of streptococci and 11% of those which received haemolytic streptococci developed lesions of the heart valves. After examining the microscopic sections of valves he was struck with the fact that the valve itself showed very little change, whereas on its surface a great deal of exudate of fibrin, leucocytes and cocci were seen. He concluded, therefore, that the streptococcal endocarditis usually develops by implantation on the surface of the valve. He says, "We/

"We are not justified, from evidence obtained from inoculation experiments, in recognising any particular class of streptococci as specific for rheumatic fever. Various rheumatic lesions may be produced by some strains in both haemolytic and non-haemolytic varieties".

(68)
MOODY in 1916, isolated streptococci from cases of chronic Alveolar abscess and injected them into 178 rabbits. He allowed the animals to live for 5-8 days. Only in one case he found well developed vegetations. The organisms used by him were of the Viridans variety.

(69)
HARTZELL and HENRICI in 1915, working with streptococci derived from cases of Pyorrhoea Alveolaris and Apical abscesses were only able to produce subendothelial haemorrhages in 2 rabbits out of a series of 24 animals.

(70)
ANDREW and HORDER examined 21 cases of malignant endocarditis due to streptococci. To their 21 they added 3 reported by GORDON. Of these 24 cases, 11 were found to be due to *S. salivarius*, 6 to *S. anginosus*, 4 to *S. faecalis*, 2 to *S. pyogenes*, 1 to pneumococcus.

(52)
THOMSON in 1925, working with streptococci obtained/

obtained endocardial lesions in 7 rabbits out of
40 animal injected with non-haemolytic streptococci.
6 of these rabbits were inoculated with *S. salivarius*.

2. GASTRIC ULCERS.

ROSENOW, ⁽⁷¹⁾ in 1919, published his results of animal experiments with strains of non-haemolytic streptococcus obtained from cases of gastro-duodenal ulcers. He was able to produce ulcers of the stomach in a large number of cases; lesions of the stomach being the only or in many cases the most gross lesions produced in the animals.

NAKAMURA, ⁽⁷²⁾ in 1924, also studied the question of focal infection in gastro-duodenal ulcers. In 9 cases with gastric symptoms gross infection of the tonsils was found. Out of these nine cases *S. viridans* was found in abundance in seven cases. In two cases slightly haemolytic streptococcus was obtained. Strains from these cases with ulcers were also studied experimentally. 66 rabbits injected with the tonsillar strains, 46 i.e. (70%) had haemorrhages or ulcers, or both, in the mucous membrane of the stomach.

THOMSON, ⁽⁵²⁾ in 1925, working with streptococci from pyorrhoea alveolaris had only one case of gastric ulcer out of 40 rabbits injected with organisms.

In/

In the present investigation out of 77 rabbits injected with non-haemolytic streptococci obtained from the tonsils of patients with symptoms of chronic cholecystitis or as in the first series from tonsils of patients with no abdominal symptoms, 5 rabbits showed haemorrhages in the fundus of the stomach alone, and in another 6 rabbits definite ulcers and haemorrhages occurred, altogether in 14% of the rabbits injected.

In no case attempts were made to recover organisms from the ulcers.

The ulcers produced were often numerous and chiefly in the fundus of the stomach. The ulcers were about 0.25 c.m. wide, and varied from 0.25 to 0.5 c.c. in length. They were usually superficial and covered with blood, and when the blood clot was rubbed off only slight gross defects in the epithelium could be detected. No peritoneal thickening was seen in the region of the ulcers.

An enormous amount has been written on the pathogenesis of peptic ulcer. When the problem is reduced to its simplest form one may say with assurance that the ordinary peptic ulcer is the result of the continued action of the gastric juice on

on an area of lowered resistance. The exciting agent is probably a varying one.

What-ever views may be held regarding the general subject of the selective localisation of the streptococci, it appears highly probable that the most common cause of the focus of weakened resistance which gives rise to peptic ulcer is a local haemotogenous infection of the mucosa.

BOYD describes the narrowing of the lumen of the arteries as the result of chronic arteritis as an effect rather than the cause.

The suggested spasm of the musculature of the stomach wall or the arteries in the wall resulting from a lack of balance between the vagus and the sympathetic stimuli may hardly be discussed here.

The question of increased acidity alone is of interest. While experimenting with rats the author found that starvation and excessive hydrochloric acid artificially produced by injections of histamine failed to produce any ulcers in the stomach of these rats.

While examining the sections of the stomach of the rabbits that showed haemorrhages or ulcers of the wall I was struck by the fact that they showed different stages of the process of ulcer/

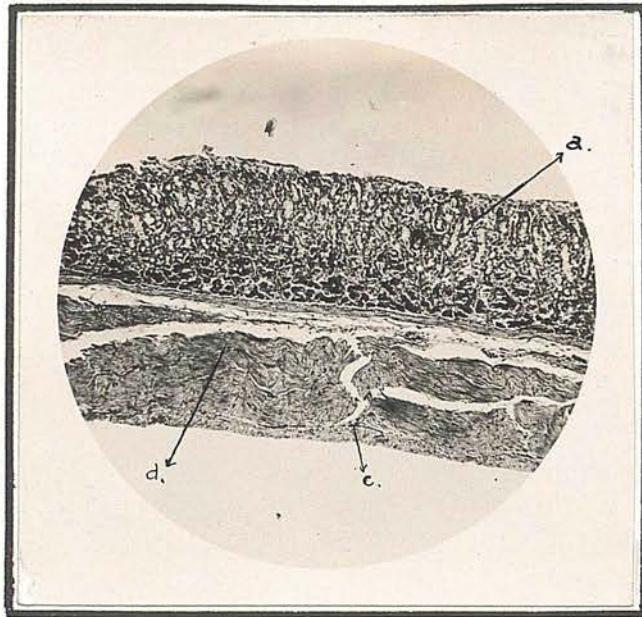


Fig. 19. Stomach Wall. (Rabbit.) Low power.

Showing the normal structure.

- a. Mucous membrane.
- b. Muscular coat.
- c. Peritoneal coat.

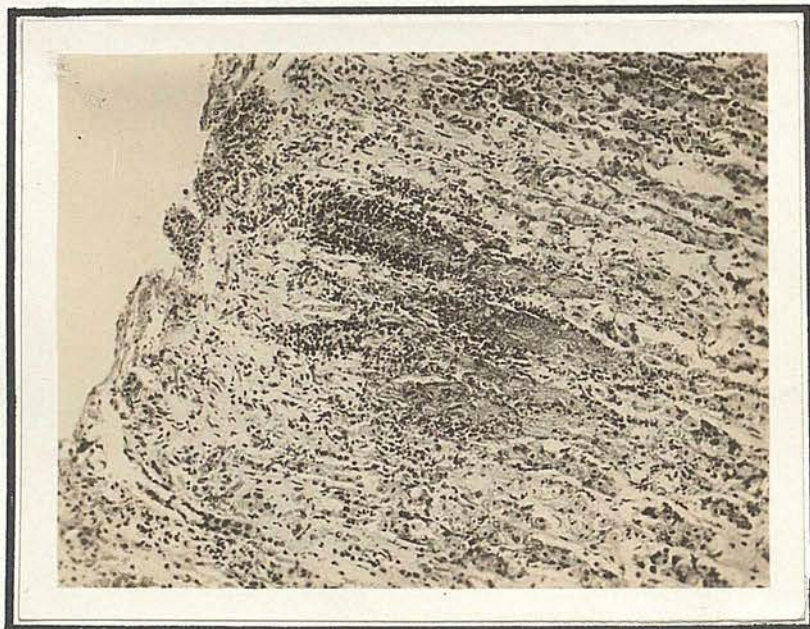


Fig. 20. Stomach Wall. (Rabbit.) High power.

Showing early infiltration by inflammatory cells around the glands. There was also very marked congestion of the mucosa,- not well seen in the photograph.

ulcer formation. I here venture to trace these stages and suggest that in some cases at least the ulcers of bacterial origin undergo these stages of development.

The normal structure of the mucosa of the stomach is a simple one. In the fundus the lymph nodules are not marked and you have the glands, blood vessels, connective tissue and then the sub-mucous coat. ((See FIG. 19.))

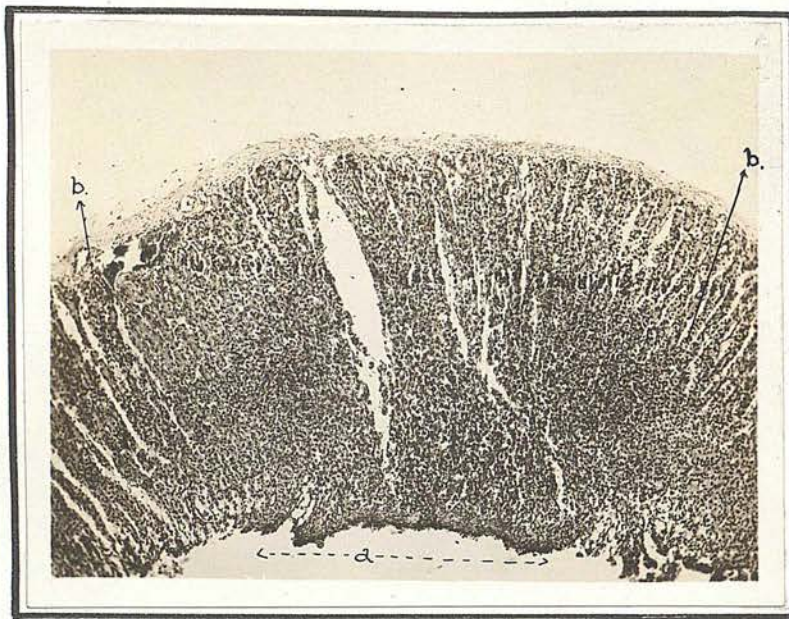


Fig. 21. Stomach Wall. (Rabbit.) High power.

Showing only the mucous membrane.

- a. Area containing a mass of inflammatory cells. The glands have all disappeared.
- b. Surrounding mucosa congested.

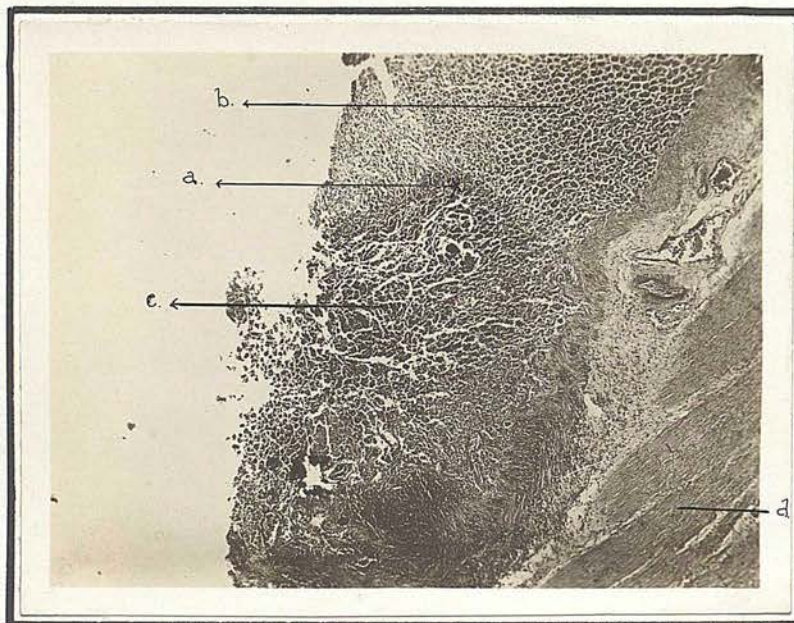


Fig. 22. Stomach Wall. (Rabbit.) Low power.

Showing a well marked ulcer in the mucosa.

- a. Wall of the ulcer.
- b. Surrounding glands of the normal mucosa.
- c. Contents of the ulcer.
- d. Muscular coat.

THE THREE STAGES OF ULCER FORMATION.

In the first stage, as was seen in 2 rabbits who died soon after the first injection, the mucous membrane was congested, the glands were normal but were surrounded by inflammatory cells which appeared to have been brought there by the blood vessels. The rest of the stomach wall was normal in all other respects. (See FIG. 20.)

In the second stage, one case only, on examination of the section one saw nothing but a large mass of inflammatory cells. The adjoining mucous membrane was congested. The glands had completely disappeared, I expect they were, so to say, strangled by the invading cells. (See FIG. 21)

In the third stage, you see the evidence of complete reaction on the part of the stomach wall. The inflammatory cells die, a definite wall is made round the area of infection and you get the final stage of the ulcer.

I may point out here, again, that whereas one rabbit injected with a particular strain of organism showed formation of ulcers, the same strain when injected into other rabbits under similar conditions did not produce any lesions of the stomach.

3. CHOLECYSTITIS.

It is hardly necessary here to go into the discussion of the avenues of infection in cholecystitis

I think it has been fully shown in the brilliant work of A.L.WILKIE⁽⁷⁾ that the infection reaches the gall-bladder via the blood stream.

The question of ascending infection from the duodenum or the descending infection from the liver or lastly a spread of infection from the liver through the lymphatics, are the other means of infection which have been discussed from time to time in the literature. I don't need to refer to this here.

In the present investigation I was able to produce definite disease in the gall-bladder of the rabbit by injecting non-haemolytic streptococci from the tonsils of the patient, who had symptoms pointing to the diseased state of the gall-bladder. But that is not the whole story. I was also able to produce cholecystitis by injecting organisms from the tonsils of patients who had no gall-bladder disease. Not only that, whereas one strain of non-haemolytic streptococcus produced cholecystitis in one rabbit, the same strain failed to produce any lesion of the gall-bladder in another rabbit under similar conditions.



Fig. 23. Rabbit's Gall-bladder. Low power.

Showing an area of inflammation.
The wall is thickened and shows congestion
and fibroblastic reaction.

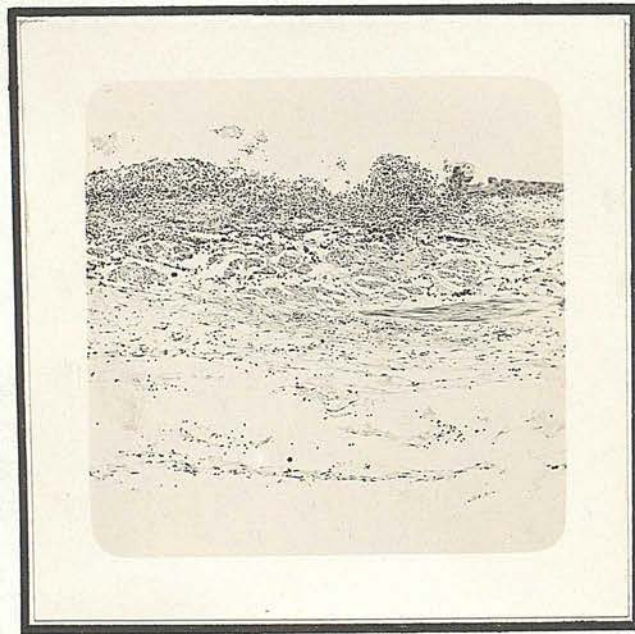


Fig. 24. Rabbit's Urinary Bladder. Low power.

Showing acute inflammation of the wall
with destruction of the mucosa etc.

POSITIVE CASES OF CHRONIC CHOLECYSTITIS.

1. Rabbit No. 2. The organisms were obtained from a case of chronic tonsillitis. Patient had no other symptoms. The organisms from the tonsils were enterococci. The animal was given 12 injections and then killed. Gall-bladder on section showed chronic inflammatory changes in the way of:-

- a. Small cell infiltration of the wall.
- b. Increased thickness of the wall by fibrous tissue formation.

2. Rabbit No. 7a. The animal died after 1 injection. The organisms were from the tonsils of a case that had no digestive trouble. The animal died of Cystitis of the urinary bladder. Fig. 23 shows the patch of inflammation in the gall-bladder and Fig. 24 shows the acute inflammation in the urinary bladder. In the urinary bladder Gram positive streptococci were seen in the sections stained with Gram stain.

It is interesting to note that the same strain of organisms, when injected into Rabbit 7b killed the animal after 5 injections with cystitis but no infection of the gall-bladder.

In/

In Rabbit 7c. The same strain produced no lesions at all.

The patient, from whom the tonsils were taken had no infection of the urinary tract.

(See **TABLE No. 5** case 7.)

3. Rabbit No. 17. (See **TABLE V.** Case No. 17.)

The animal was injected with 'S. non-haemolyticus 1. The animal was killed and showed mucocoele of the gall-bladder. No sections were taken as the specimen was preserved entire. **Fig. 25** is a water colour drawing of the organ. (See **Fig. 25**)

4. Rabbit No. 20a.

This case was of great interest. The patient gave a history of febrile attacks accompanied by jaundice. The diseased tonsils were removed and an enterococcus was obtained. When the organisms were injected into R20a the animal died, after three injections. The naked eye appearance and the histological findings are well depicted in the accompanying **Figs. 26** and **27**.

The gall-bladder wall was greatly thickened and was fleshy looking (See **Fig. 26**)

Microscopically, the mucous membrane was seen to be destroyed. There was oedema of the wall/



Fig. 27. Rabbit's Gall-bladder. Low power.

Showing markedly thickened wall.

- a. Broken down mucous membrane.
- b. Luschka's cyst.



Fig. 28. Wall of the Gall-bladder. Oil immersion.

Showing streptococci in the wall.

Rabbit No: 20A.

. wall which was very greatly thickened.

LUSCHKA'S cysts were also present.

(See Fig. 27)

The Gram stained sections showed the presence of streptococci in the wall of the organ. (See Fig. 28)

The same strain was injected into another rabbit No.20b.

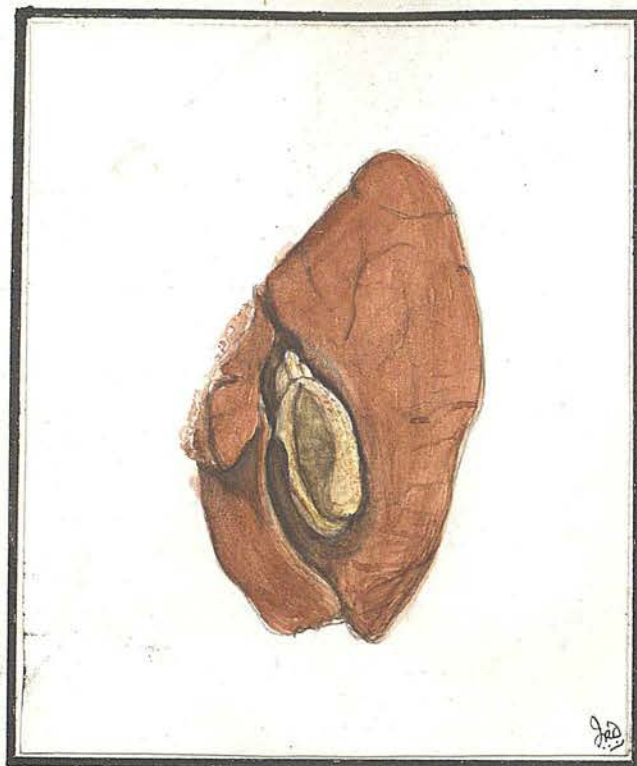


Fig. 29. Rabbit's Gall-bladder. Water colour.
Rabbit No: 20B. Showing thickened
wall.

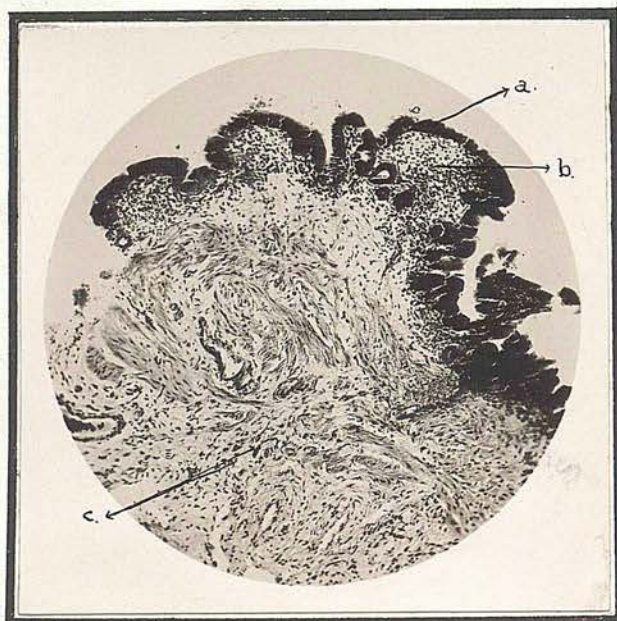


Fig. 30. Rabbit Gall-bladder. Low power.
Showing chronic cholecystitis.

- a. Mucous membrane intact.
- b. Submucosa with small cell
infiltration.
- c. Increase in the fibrous tissue of the
wall.

5. Rabbit No. 20b

The animal was injected with the same strain as the last one. Definite cholecystitis was again produced.

Naked Eye. The gall-bladder was opaque. The contents were normal in appearance. (See Fig. 29.)

Microscopically.

The microscopic appearances of the gall-bladder were very typical of the condition. There were the following points worth noting.

1. The mucous membrane was intact.
2. The submucosa was infiltrated with small inflammatory cells.
3. Marked increase in the thickness of the wall of the gall-bladder.

(See Fig. 30)

The changes in the human gall-bladder are identical with those seen above. The accompanying micro-photograph 31 was the gall-bladder of case No. 13. (See TABLE VII.)

6. Rabbit No 21.

The animal was injected with organisms from a tooth abscess of a definite case of cholecystitis. The animal was given 8 injections and then killed.

Sections of the gall-bladder showed definite thickening of the wall with cellular infiltration.



FIG. 31. Human Gall Bladder. Low power.
showing chronic cholecystitis.

4. KIDNEY LESIONS.

HARTZELL and HENRICI⁽⁶⁹⁾ found that *S. viridans* caused abscess formation in the kidney and that these usually occurred in the cortex, but occasionally also in the medulla.

Similar results were obtained by LE COUNT⁽⁷³⁾ and JACKSON who worked with non-haemolytic streptococci.

MOODY⁽⁶⁶⁾ did not describe kidney lesions in his work on streptococci from cases of chronic Alveolar Abscess. He merely obtained small haemorrhagic foci usually situated beneath the capsule and scattered through the cortex.

HENRICI⁽⁶⁷⁾ also found abscesses in the kidney after the inoculation of rabbits with streptococci.

THOMSON⁽⁵²⁾ described changes in the kidneys also. In her case she saw interstitial changes in addition to kidney abscesses.

In the present investigation, I was able to detect kidney abscesses, whereas although great search was made for the interstitial changes no such changes were observed.

As in other investigations the lesions in the kidney consisted of microscopic infiltration of inflammatory/

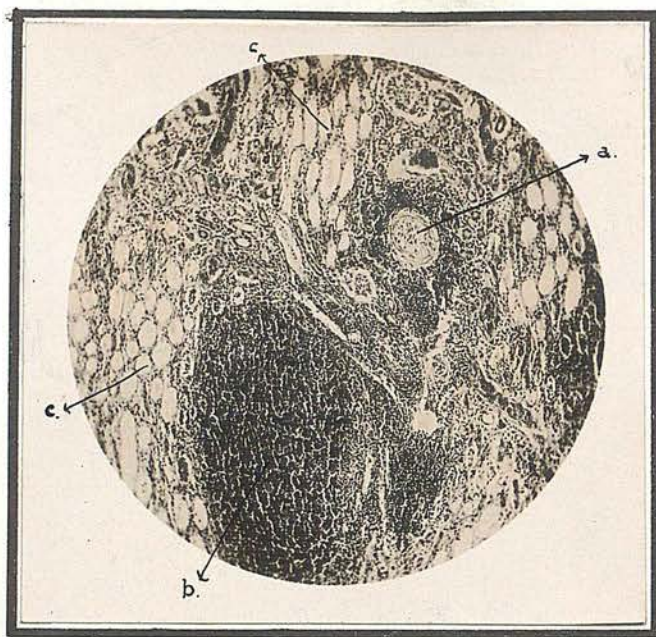


Fig. 32. Rabbit's Kidney. Low power.

Showing abscess formation in the cortex.
Notice the perivascular collection of
inflammatory cells.

- a. Glomerulous with collections of cells.
- b. Abscess.
- c. Dilated tubules in the cortex.

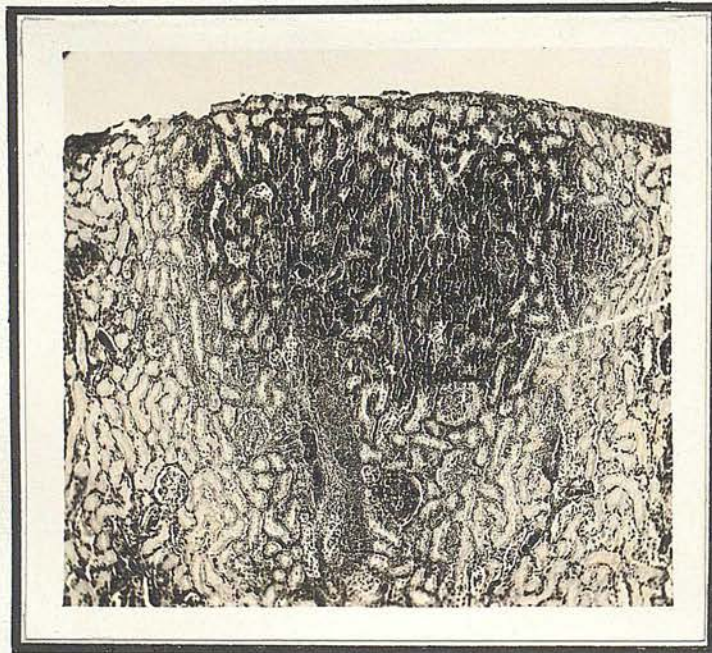


Fig. 33. Rabbit's Kidney. Low power.

Showing marked infiltration of small cells
round the tubules and glomeruli in the
cortex.

Tubules are greatly distended again.

inflammatory cells to marked naked eye abscesses.

The abscesses occurred chiefly in the cortex, but in a few cases also in the medulla. The collection of cells round the glomeruli and the blood vessels was an almost universal finding. Fig. 32 shows a large collection of inflammatory cells forming an abscess and also the collection of cells round the glomerulus.

Fig. 33 also shows marked infiltration of the cortex with the inflammatory cells.

It must be also noted that large collections of Gram positive cocci were seen in these areas of cellular infiltration.

Lastly, the incidence of kidney lesions was extremely low, where the animals were merely given intravenous injections of streptococci, whereas in the series of animals where laparotomy was performed, the kidney lesions were very common, nearly 66% of animals. (See PART IV.)

GENERAL SUMMARY AND CONCLUSIONS.

1. Faucial tonsils occur throughout Mammalia.
 In man and higher monkeys they have reached
 the final stage of development.
2. Faucial tonsils have a rich lymphatic drain-
 age, and are drained into a plexus of lym-
 phatics in the retro-tonsillar space.
3. Incidence of non-haemolytic streptococci, as
 determined by the technique employed in the
 present investigation is very high, whereas
 the incidence of haemolytic streptococci and
 pneumococci is very low.
4. Non-haemolytic streptococci from the paren-
 chyma of the tonsils and deeper crypts from
 cases of chronic cholecystitis showed no
 particular tendency to localisation in the
 gall-bladder of the rabbit when the organisms
 were injected intravenously.
5. Incidence of throat infection is extremely
 negligible in cases of chronic cholecystitis.
- 6./

6. Non-haemolytic streptococci obtained from the diseased gall-bladder, when injected directly into the tonsils of two dogs produced tonsillitis, but showed no tendency to localisation in the gall-bladder of the animals.
7. Trauma of the gall-bladder alone did not produce cholecystitis.
8. Trauma plus the organisms localised in only two rabbits out of 9 animals employed.
9. By lowering the general resistance of the body, kidney abscesses occurred very commonly.
10. By the new method of tonsil puncture one can get at the micro-organisms that have passed the tonsillar barrier.
11. Whatever may be the role of organisms in producing cholecystitis they are not the sole etiological factors, and they show no inherent quality by means of which they can go and settle down in any particular organ in preference to another organ.
12. Non-haemolytic streptococci are secondary invading organisms in gall-bladder disease.

ACKNOWLEDGEMENTS.

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I wish also, to thank Dr. MARTIN and Dr. HALL for giving me all the facilities to obtain the material, and the latter in particular, in helping me to evolve a new method of tonsil puncture.

The experimental, bacteriological and laboratory investigations were carried out in the Surgical Department, Edinburgh University. To the technical staff of the Department I express my thanks for willing and skilled assistance.

To Doctors MacLAUCHLAN and ILLINGSWORTH I am indebted for checking my bacteriological and pathological findings respectively.

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A P P E N D I X .

AGE. 31

OCCUPATION. House-
wife.

COMPLAINT. " Sore-throat. "

HISTORY.

Patient was admitted to the Ward 33 on account of her digestive trouble. During the past three years patient complained of sickness after meals, heartburn and flatulence. She constantly suffers from constipation.

The pain is of a gnawing character and is worse $\frac{1}{4}$ of an hour after food. It is relieved by food and vomiting. The pain is situated in the epigastrium. It is also made worse by taking potatoes and greasy food.

Patient has never been jaundiced and never vomited blood.

ON EXAMINATION.

Patient an extremely obese
TEETH in a fairly good condition.

TONSILS. Patient suffered from attacks of sore-throat ever since her childhood. Both her tonsils were enlarged and septic.

ABDOMEN. There was tenderness on palpation in the right iliac fossa and in the region of the gall-bladder.

No enlargement of the Liver or Spleen was detected.

OPERATION. 10.5.29. Dr. Martin.

The tonsils were septic and were removed by dissection in the ordinary way.

BACTERIOLOGY/

BACTERIOLOGY.

Profuse growth was obtained from the tonsils.

The organisms being:-

- a. Staphlococcus.
- b. Strep. Salivarius.

ANIMAL INOCULATION.

RABBIT NO: 1. was inoculated as follows:

15.5.29.	1c.c. of the suspension of organisms in		
	saline.		
20.5.29.	2 c.c.	"	"
25.5.29.	2.5.c.c.	"	"
30.5.29.	3.0.c.c.	"	"
3.6.29.	4.0.c.c.	"	"
8.6.29.	4.5.c.c.	"	"
13.6.29.	5.0.c.c.	"	"
19.6.29.	5.0.c.c.	"	"
24.6.29.	5.0.c.c.	"	"
29.6.29.	5.0.c.c.	"	"
4.7.29.	5.0.c.c.	"	"
9.7.29.	5.0.c.c.	"	"

12 injections were given in all.
The animal survived and showed no sign of disease. It was allowed to live for another 2 months.

9.9.29. The animal was killed by chloroform. Post mortem done immediately.

Heart, lungs, appendix, stomach and intestine, urinary bladder and kidneys were perfectly normal.

GALL-BLADDER

(a) Naked eye. Slight opacity but no marked changes.

(b) Section. (1) H & E showed hyperplasia of the mucous membrane. No thickening of the wall was evident. No small cell infiltration.

(ii) Gram. several sections were searched and no organisms were seen.

SUMMARY. No cholecystitis was produced.

Case No: 2.

NAME. MAGREGOR, James AGE. 37

ADMITTED. 13.5.29. OCCUPATION. Police-man

COMPLAINT. " attacks of tonsillitis."

HISTORY.

During the war patient had dyspeptic symptoms. These were vague. He complains of no digestive trouble now. He never had jaundice.

He had slight difficulty in breathing through the nose for which septum of the nose was removed.

Patient often has attacks of Lumbago.

ON EXAMINATION.

Patient is a very well built healthy adult.

TEETH. Good.

TONSILS. Patient suffered from attacks of tonsillitis very frequently. Both tonsils were hypertrophied and septic.

ABDOMEN. Nil to note.

OPERATION. 13.5.29. Dr. Martin.

The tonsils were removed under local anaesthesia by dissection in the ordinary way.

BACTERIOLOGY.

Profuse growth was obtained from the tonsils.

The organisms obtained were:-

(a) Staphylococcus

(b) Streptococcus - The chains were short, and the organisms grew on MacConkey's medium, they were heat resistant and fermented aesculin. They were insoluble in bile and showed no haemolysis.

The organism was therefore called ENTEROCOCCUS.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 2 was inoculated as follows:-

17.5.29.	2.0 c.c. of the suspension of organisms		
			in saline.
22.5.29.	2.0 c.c.	"	" "
27.5.29.	2.5 c.c.	"	" "
3.6.29.	3.0 c.c.	"	" "
8.6.29.	4.0 c.c.	"	" "
13.6.29.	4.5 c.c.	"	" "
19.6.29.	5.0 c.c.	"	" "
24.6.29.	5.0 c.c.	"	" "
29.6.29.	5.0 c.c.	"	" "
4.7.29.	5.0 c.c.	"	" "
9.7.29.	5.0 c.c.	"	" "
15.7.29.	5.0 c.c.	"	" "

In all 12 injections were given. The animal looked ill and was therefore killed the following day after the last injection.

16.7.29. Animal killed by chloroform and post mortem done immediately.

Heart, lungs, appendix, stomach and intestine, spleen, urinary bladder and kidneys nothing to note.

GALL-BLADDER. (a) Naked eye. Showed definite opacity of the walls. On opening the organ it showed the thickened wall even more markedly.

(b) Section. (i) H & E showed the mucous membrane well. Slight thickening of the wall by increased amount of fibrous tissue. No small cell infiltration.

(ii) Gram. No organisms detected.

SUMMARY. Chronic inflammatory changes produced with fibrous tissue formation in gall-bladder. No other organs involved.

Case No: 3.

NAME. LIVINGSTON, Murray AGE. 30
ADMITTED. 13.5.29. OCCUPATION. Policeman
COMPLAINT. " repeated sore-throats "

HISTORY.

Patient suffers from bad colds every winter. He now suffers from general weakness.

He complained of no other trouble of any kind. Never had jaundice. No other abdominal complaint.

ON EXAMINATION. Patient an extremely well built individual.

TEETH. Good.

TONSILS. Both tonsils hypertrophied and ulcerated and very septic.

ABDOMEN. Nil to note.

OPERATION. 13.5.29. Dr Martin.
 Both the tonsils were removed, under local anaesthesia, by the usual method.

BACTERIOLOGY.

Profuse growth was obtained from the tonsils.

The organisms obtained were:-

(a) Streptococcus.Salivarius.
 (see table)

ANIMAL INOCULATION.

RABBIT NO: 8 was inoculated as follows:-
 17.5.29. 2.0 c.c. of the suspension of organisms in saline
 22.5.29. 2.0 c.c. " " "
 27.5.29. 2.5 c.c. " " "
 3.6.29. 3.0 c.c. " " "
 8.6.29. 4.5 c.c. " " "
 13.6.29. 4.5 c.c. " " "
 19.6.29. 5.0 c.c. " " "
 24.6.29. 5.0 c.c. " " "
 29.6.29. 5.0 c.c. " " "
 4.7.29. 5.0 c.c. " " "
 9.7.29. 5.0 c.c. " " "
 15.7.29. 5.0 c.c. " " "

In/

In all 12 injections were given. The animal was allowed to live for nearly 2 months afterwards.

27.9.29. The animal was found dead. Post mortem examination was carried out within a few hours after the death.

LUNGS.

The pleural cavity had fluid. The lungs were congested and livery.

Pneumonia. Confirmed by examining the sections of the lung tissue.

Spleen was enlarged and congested.

Heart, stomach and intestine, appendix, urinary bladder kidneys nil to note.

GALL-BLADDER.

- (a) Naked Eye. No abnormality.
- (b) Section. (i) H & E showed a normal gall-bladder. (ii) Gram. No organisms seen.

SUMMARY.

Patient showed no history of gall-bladder disease.

The animal died of pneumonia.

No changes were produced in the gall-bladder.

Case No: 4

NAME. MURRAY, William AGE. 30
ADMITTED. 3.6.29. OCCUPATION. Police-man
COMPLAINT. "sore-throat"

HISTORY.

Patient has been troubled with attacks of tonsillitis ever since childhood.

Patient never had any other trouble. No digestive trouble. No appendicitis. Never had jaundice.

ON EXAMINATION.

Patient a well developed healthy adult.

TEETH. Good.

TONSILS. Both tonsils were septic.

ABDOMEN. Further examination revealed nothing worth noting.

OPERATION.

3.6.29. Dr. Martin.

The tonsils were removed by dissection in the ordinary way under local anaesthetic.

BACTERIOLOGY.

Profuse growth was obtained from the tonsils.

A pure culture of a non-haemolytic strep. was obtained.

STREPTOCOCCUS EQUINUS.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 4 was inoculated as follows:-

8.6.29.	3.0 c.c.	of the suspension of organisms		
			in saline.	
13.6.29.	4.0 c.c.	"	"	"
19.6.29.	5.0 c.c.	"	"	"
24.6.29.	5.0 c.c.	"	"	"
29.6.29.	5.0 c.c.	"	"	"
4.7.29.	5.0 c.c.	"	"	"
9.7.29.	5.0 c.c.	"	"	"
15.7.29.	5.0 c.c.	"	"	"
20.7.29.	5.0 c.c.	"	"	"
25.7.29.	5.0 c.c.	"	"	"
30.7.29.	5.0 c.c.	"	"	"
10.7.29.	5.0 c.c.	"	"	"

In all 12 injections were given. The animal was allowed to live till it died on the 1.10.29.

1.10.29. The post mortem was done within a few hours after the death of the animal.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys, urinary bladder were normal.

- GALL-BLADDER. (a) NAKED EYE. The gall-bladder was very large, in fact twice the size of a normal one. The wall was thin but slightly whitish looking. On opening the organ two cavities were discovered. These communicated at one end and were separated by a septum.
- (b) SECTION. (i) H & E did not show any mucous membrane. The walls were not thickened. No cellular infiltration seen.
- (ii) GRAM. No organisms detected even after examining several sections.

SUMMARY. The case was not one of cholecystitis. The organisms from the tonsils when injected in a rabbit did not produce any changes in the gall-bladder.

Case No: 5

NAME. BOYD, Miss Helen, AGE. 30

ADMITTED. 3.6.29. OCCUPATION. Domestic-servant.

COMPLAINT. "sore-throat"

HISTORY.

Patient has suffered from throat trouble ever since childhood. An operation on tonsils was done 8 yrs. ago, but but it has been giving her trouble in spite of that.

Patient had Diphtheria and Scarlet fever.

Patient never complained of any thing pertaining to her abdomen or digestive system. Never had jaundice.

ON EXAMINATION.

TEETH. very bad with Pyorrhoea.

TONSILS. Both tonsils were septic.

ABDOMEN. was perfectly normal. No tenderness or rigidity in either the gall-bladder area or in the iliac fossae.

OPERATION.

3.6.29. Dr. Martin.

Both the tonsils were removed under local anaesthesia in the usual manner by dissection.

BACTERIOLOGY.

A profuse growth was obtained from the tonsils.

a. Staphylococcus.

b. Streptococcus ignavus. a short chained non-haemolytic, bile insoluble, not resistant to 60 C organism. Did not ferment any sugars. (see table)

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 5 was inoculated as follows:-

8.6.29.	3.0.c.c.	of the suspension of organisms		
			in saline.	
13.6.29.	4.0.c.c.	"	"	"
19.6.29.	5.0.c.c.	"	"	"
24.6.29.	5.0.c.c.	"	"	"
29.6.29.	5.0.c.c.	"	"	"
4.7.29.	5.0.c.c.	"	"	"
9.7.29.	5.0.c.c.	"	"	"
15.7.29.	5.0.c.c.	"	"	"
20.7.29.	5.0.c.c.	"	"	"
25.7.29.	5.0.c.c.	"	"	"
30.7.29.	5.0.c.c.	"	"	"
10.8.29.	5.0.c.c.	"	"	"

In all 12 injections were given. The animal was allowed to live till it died on the 24th August 29.

27.8.29. The post mortem was done three days after the death of the animal.

All the organs showed post mortem changes. The heart, lungs, stomach and intestine, appendix, spleen, kidney and urinary bladder were of no interest.

GALL-BLADDER.

(a) Naked eye. Post mortem changes.

(b) Section. (i) H & E. No structure would be made out. The wall consisted of a very thin strand of fibrous tissue.

(ii) Gram. No organisms were found.

SUMMARY.

The case was not one of cholecystitis. Animal inoculation did not produce any changes either in the gall-bladder or in any other organ.

Case No: 6.

NAME. GALLOWAY, Mrs., AGE . 39
ADMITTED. 20.6.29. OCCUPATION. House-wife.
COMPLAINT. "endo-metritis."

HISTORY.

Patient was admitted to Ward 34 on account of her gynaecological trouble. There on examination her tonsils were discovered to be diseased. Tonsilectomy was therefore advised.

ON EXAMINATION.

Patient well developed and nourished.

TEETH. A few showing evidence of Pyorrhoea.

TONSILS. Patient gave no history of persistent throat trouble, excepting very occasional cold. Both her tonsils were, however, hypertrophied and septic.

ABDOMEN. Patient gave no history of any digestive trouble. Never had jaundice or appendicitis. There was nothing to note in her abdomen.

OPERATION. 20.6.29. Dr Martin.

The tonsils were removed by dissection in the ordinary way under local anaesthetic.

BACTERIOLOGY.

Profuse growth was obtained from the tonsils.

A pure growth of a non-haemolytic strept. was obtained.

STREPTOCOCCUS IGNAVUS. (see table)

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 6A was inoculated as follows:-

13.6.29.	3.0.c.c.	of the suspension of organisms		
			in saline.	
19.6.29.	4.0.c.c.	"	"	"
24.6.29.	5.0.c.c.	"	"	"
29.6.29.	5.0.c.c.	"	"	"
4.7.29.	5.0.c.c.	"	"	"
9.7.29.	5.0.c.c.	"	"	"
15.7.29.	5.0.c.c.	"	"	"

In all 7 injections were given. The animal died 3 days after the last injection.

19.7.29. Post mortem examination revealed nothing. All the organs were perfectly normal and the death of the animal could not be accounted for.

RABBIT NO: 6B. was inoculated as follows:-

20.7.29.	5.0.c.c.	of the suspension of organisms		
			in saline.	
25.7.29.	5.0.c.c.	"	"	"
10.8.29.	5.0.c.c.	"	"	"
15.8.29.	5.0.c.c.	"	"	"
20.8.29.	5.0.c.c.	"	"	"
27.8.29.	5.0.c.c.	"	"	"
31.8.29.	5.0.c.c.	"	"	"

In all 7 injections were again given. The maximum dose was not increased but 5.0 c.cs were given from the very beginning. The animal was allowed to live till 2 months afterwards. It was then killed by chloroform.

30.10.29. Post mortem examination again revealed nothing. All the ~~organisms~~ were perfectly normal. The gall-bladder was sectioned. Nothing to note.

SUMMARY.

The case was not one of cholecystitis. The organism obtained from the septic tonsils were of a very low virulence and in the 2 rabbits employed even large doses of living organisms, when given intra-venously, did not produce any lesions whatever.

Case No: 7.

NAME. CULLEN, Miss Christina

ADMITTED. 20.6.29.

COMPLAINT. "Sore-throat."

HISTORY.

Patient had an attack of Diphtheria 12 years ago, and a second attack 4 years ago.

Patient is subject to periodic attacks of tonsillitis specially during the winter season.

Patient gave no history of any digestive disorder. Her appetite is good. Never had jaundice or appendicitis. She is normally inclined to be constipated and has to take medicine regularly to keep her right.

ON EXAMINATION

Patient obese but fairly healthy.

TEETH. all artificial.

TONSILS. Both tonsils hypertrophied and septic.

ABDOMEN. Nil to note.

OPERATION. 20.6.29. Dr Martin.

The tonsils were removed in the usual way by dissection under local anaesthetic.

BACTERIOLOGY.

Profuse growth was obtained from the tonsils.

A pure growth of a non-haemolytic streptococcus was obtained.

S. SALIVARIUS. (see table)

ANIMAL INOCULATION.

RABBIT NO:7A was inoculated as follows:-

25.6.29. 3.0 c.c. of the suspension of organisms in saline.

29.6.29. The animal died 4 days afterwards.

Post/

Post mortem examination was done on the same day. On opening the abdomen I was struck by the enormous distention of the urinary bladder. On opening it thick urine escaped and a large area of acute inflammation was discovered. On sectioning this the naked eye findings were confirmed.

(i) H & E sections showed destruction of the stratified epithelium, congested blood vessels, large numbers of inflammatory cells etc. (micro-photograph) (ii) Gram sections showed large numbers of Gram positive cocci arranged in chains. (micro-photograph)

GALL-BLADDER. (i) NAKED EYE was more opaque than normal. The opacity was in patches. The bile inside was thick.

(ii) SECTION. a. H & E showed an area of acute inflammation, going on to the subacute stage with fibroblastic reaction. This change was only patchy the rest of the gall-bladder wall being normal.

b. Gram sections did not reveal any organisms.

There was nil to note in other organs.

RABBIT NO: 7B. was then inoculated as follows:-

29.6.29.	3.0.c.c. of the suspension of organisms			
			in saline.	
4.7.29.	4.0.c.c.	"	"	"
10.7.29.	5.0.c.c.	"	"	"
15.7.29.	5.0.c.c.	"	"	"
20.7.29.	5.0.c.c.	"	"	"

In all 5 injections were given. The animal died the following day after the last injection.

22.7.29. Post mortem examination done on the same day.

On opening the abdomen I was struck by the enormous distension of the urinary bladder. On opening it thick urine escaped and a large area of congestion was discovered.

(i) H & E sections of the U. bladder showed marked congestion and some evidence of inflammation, which however was not as marked as in the last case.

(ii)/

Case No: 8.

NAME. Melville, Miss Elizebeth. AGE. 24.

ADMITTED. 29.6.29. OCCUPATION.
Domestic.

COMPLAINT. "pain in the region of the appendix."

HISTORY.

Patient was admitted to Ward 34 on account of her complaint. The pain was in the right iliac fossa slightly lower than the Macburney's point. The pain was spasmodic and comes worse at the menstrual periods.

Patient had her appendix removed 2 years ago.

Patient did not complain of any of any digestive disorder of any kind. Never had jaundice and no biliary colic.

ON EXAMINATION. TEETH. All in a fairly good condition.

TONSILS. Patient gave no history of any throat trouble. Both her tonsils were normal in size but not in appearance. The right tonsil was septic.

ABDOMEN. No tenderness in the gall-bladder area.

OPERATION. 29.6.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia by the usual method of dissection.

BACTERIOLOGY. Profuse growth was obtained from the tonsils. A pure culture of *S. mitis* was obtained.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 8. was inoculated as follows:-

4.7.29.	3.0.c.c.	of the suspension of organisms		
			in saline.	
9.7.29.	4.0.c.c.	"	"	"
15.7.29.	5.0.c.c.	"	"	"
20.7.29.	5.0.c.c.	"	"	"
25.7.29.	5.0.c.c.	"	"	"
30.7.29.	5.0.c.c.	"	"	"
10.8.29.	5.0.c.c.	"	"	"
15.8.29.	5.0.c.c.	"	"	"
27.8.29.	5.0.c.c.	"	"	"
31.8.29.	5.0.c.c.	"	"	"

In all 10 injections were given. The animal lost wt. and was very ill on account of a traumatic wound on the right shoulder. It was therefore killed with chloroform.

4.9.29. Post mortem was done immediately.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder normal.

GALL-BLADDER.

(a) Naked Eye. the colour of the gall-bladder was more grey than is normally. The water colour drawing is an attempt to show it. There was no marked thickening of the wall. The bile inside it was fairly normal in appearance and consistency.

(b) Section. (i) H & E. showed hyperplasia of the mucous membrane which was intact. There was not thickening of the wall and no cellular infiltration.

(ii) Gram. Large clusters of Gram positive cocci were seen. They appeared to be on the section, rather than part of the section. Contamination was suspected.

SUMMARY.

The case was not one of cholecystitis. The organisms obtained from the tonsils produced no lesions whatsoever.

Case No: 9.

NAME. Jamieson, Mrs. AGE. 35.

ADMITTED. 29.6.29. OCCUPATION. House-wife.

COMPLAINT. "sore-throat."

HISTORY.

Patient has been suffering from indigestion for the past five years. This consists of heart burn and water brash. Flatulence and epigastric discomfort has also been troubling her. She also gets slight pain in her right shoulder. She had no pain or any colic.

Patient has never vomited.. Never has been jaundiced. Never had appendicitis.

She is very greatly troubled with constipation.

ON EXAMINATION.

TEETH. Top set artificial. Lower teeth not so bad.

TONSILS. Patient has been suffering from frequent attacks of tonsillitis. Both her tonsils were hypertrophied and septic.

ABDOMEN. Patient obese. No tenderness in the region of the gall-bladder. No definite tenderness in the epigastrium either.

OPERATION. 29.6.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia by the usual method of dissection.

BACTERIOLOGY.

A profuse growth was obtained from the tonsils.

A pure culture of S. SALIVARIUS was obtained from both the tonsils.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 9 was inoculated as follows:-

4.7.29.	3.0.c.c.	of the suspension of organisms		
			in saline.	
9.7.29.	4.0.c.c.	"	"	"
15.7.29.	5.0.c.c.	"	"	"
20.7.29.	5.0.c.c.	"	"	"
25.7.29.	5.0.c.c.	"	"	"
30.7.29.	5.0.c.c.	"	"	"

In all 6 injections were given. The animal died on the following day after the last injection.

10.8.29. Post mortem examination was done. Heart, lungs, stomach and intestine, appendix, spleen, and kidneys were normal. Urinary bladder was distended but did not contain turbid urine, and no signs of disease could be seen.

GALL-BLADDER. (a) Naked Eye. The gall-bladder was normal looking.
 (b) Section. (i) H&E. showed hardly any structure on account of the marked P.M. changes. No mucous membrane was present. There was, however, no evidence of any thickening of the wall.
 (ii) Gram. No organisms were seen in the several sections examined.

SUMMARY. The case was one that was suspected of gall-bladder disease. The organisms obtained from the tonsils produced no lesions in the rabbit.

Case No: 10.

NAME. Illingsworth, Mr C.F.W. AGE. 30.

ADMITTED. OCCUPATION. Surgeon.

COMPLAINT. "repeated tonsillitis."

HISTORY.

Patient complained of no digestive trouble. He suffered from repeated attacks of tonsillitis and colds.

Patient never had jaundice.

ON EXAMINATION.

TEETH. Good

TONSILS. Both tonsils were hypertrophied and septic.

ABDOMEN. was not examined.

OPERATION, Dr Martin.

BACTERIOLOGY.

Profuse growth was obtained from both the tonsils.

The left tonsil gave a pure growth of S. EQUINUS where as the right tonsil gave a mixture of Staphylococci and S.equinus.

ANIMAL INOCULATION.

RABBIT NO: 10. was inoculated as follows:-

4.7.29	3.0 c.c.	of the suspension of organisms in saline.
9.7.29.	4.0 c.c.	" " "
15.7.29.	5.0 c.c.	" " "
20.7.29.	5.0 c.c.	" " "
25.7.29.	5.0 c.c.	" " "
30 7.29	5.0 c.c.	" " "
10 8.29	5.0 c.c.	" " "
15.8.29.	5.0 c.c.	" " "
27.8.29	5.0 c.c.	" " "
31.8.29.	5.0 c.c.	" " "
5.9.29.	5.0 c.c.	" " "
11.9.29	5.0 c.c.	" " "
17.9.29.	5.0 c.c.	" " "

In/

In all 13 injections were given. The animal died 9 days after the last injection.

26.9.29 Post mortem examination was done. Pleural cavities full of pus. Lungs showing signs of pneumonia.

Heart pericarditis although the endocardium was normal. Stomach and intestine, appendix, kidneys and urinary bladder were normal.

Spleen was congested and enlarged.

GALL-BLADDER.

(a) Naked Eye. Normal

(b) Section. (i) H & E, showed no thickening of the wall and no cellular infiltration. Mucous membrane was destroyed.

(ii) Gram revealed no organisms.

SUMMARY.

The case was not one of cholecystitis. Organisms obtained from the diseased tonsils probably lowered the vitality of the animal to such an extent that the last injection caused pleurisy and pneumonia which caused the death of the animal.

Gall-bladder was not affected.

Case No: 11.

NAME. Macpherson, Mrs. AGE. 35.

ADMITTED. 1.7.29. OCCUPATION. House-wife.

COMPLAINT. "sore-throat."

HISTORY.

Patient, a mother of two children, has been suffering from repeated attacks of tonsillitis. The last one being 3 weeks ago.

After the birth of the last child she had an acute attack of appendicitis. No operation was performed. She never had any trouble of the same nature since.

Patient complained of constant flatulence and discomfort in the epigastric region. She had no vomiting. No colic or jaundice. She complained of heartburn. No special kind of food made any difference.

ON EXAMINATION.

TEETH. not in a good state.

TONSILS. Both the tonsils were enlarged and hypertrophied.

ABDOMEN. Patient rather an obese subject. No tenderness in the gall-bladder area or the epigastrium.

OPERATION. 1.7.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia by the usual method of dissection.

BACTERIOLOGY.

A profuse growth was obtained from both the tonsils. Large numbers of Staphylococci were present in addition to S. NON-HAEMOLYTICUS I.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 11 was inoculated as follows:-

9.7.29.	3.0 c.c.	of the suspension of organisms in saline.
15 7.29.	4.0 c.c.	" " "
20.7.29.	5.0 c.c.	" " "
25.7.29.	5.0 c.c.	" " "
30.7.29.	5.0 c.c.	" " "
10.8.29.	5.0 c.c.	" " "
15.8.29.	5.0 c.c.	" " "
27.8.29.	5.0 c.c.	" " "
31.8.29.	5.0 c.c.	" " "
5.9.29.	5.0 c.c.	" " "
11.9.29.	5.0 c.c.	" " "
17.9.29.	5.0 c.c.	" " "

In all 12 injections were given.
The animal died the same day after the last injection.

18.9.29. The animal had lost weight considerably. The post-mortem examination was done.

Heart, lungs, stomach and intestine, appendix, kidneys and urinary bladder were normal.

GALL-BLADDER. (a) NAKED EYE. Nil to note.
(b) SECTION. (i) H & E. showed marked P.M. changes. No thickening of the gall-bladder wall and no small cell infiltration.
(ii) GRAM. No organisms were seen in the several sections examined.

SUMMARY.

The case was not one of cholecystitis.

The organisms obtained from the tonsils produced no lesions in the rabbit.

Case No: 12.

NAME. Borthwick, Mrs. AGE. 29.
ADMITTED. 5.7.29. OCCUPATION. House-wife.
COMPLAINT. "bad throat."

HISTORY.

Patient, a mother of two children, had a miscarriage in the Maternity Hospital. During the puerperium she developed purexia. This was traced to the bad condition of the tonsils. Professor Johnston advised removal of tonsils.

Patient also complained of indigestion, flatulence, and a feeling of discomfort and tightness round the waist particularly after food. Patient also had pain in her right shoulder. Constipation is the rule.

Patient has never been jaundiced.
 No appendicitis.

ON EXAMINATION.

TEETH. A few bad ones in the lower jaw.

TONSILS. Both hypertrophied. The right one being more septic looking. Patient did not give any history of repeated tonsillitis.

ABDOMEN. Patient very obese. On deep palpation there was definite tenderness in the region of the gall-bladder. Nothing else to note.

OPERATION. 5.7.29. Dr Hall.
 Both the tonsils were removed under local anaesthesia by the usual method of dissection.

BACTERIOLOGY. A profuse growth of S.MITIS was obtained.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO. 12. was inoculated as follows:-

10.7.29.	5.0.c.c.	of the suspension of organisms		
			in saline.	
15.7.29.	5.0.c.c.	"	"	"
20.7.29.	5.0.c.c.	"	"	"
25.7.29.	5.0.c.c.	"	"	"
30.7.29.	5.0.c.c.	"	"	"
10.8.29.	5.0.c.c.	"	"	"
15.8.29.	5.0.c.c.	"	"	"

In all 7 injections were given.
The animal died on 25.8.29 i.e. 10 days
after the last injection.

27.8.29. The post mortem examination was done. The animal gradually lost weight.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder normal.

GALL-BLADDER.

(a) Naked Eye. Normal in appearance.

(b) Section. (i) H & E. showed marked P.M. changes. There was no thickening of the wall of the gall-bladder and there was no small cell infiltration. The mucous membrane was broken down.

(ii) Gram No organisms were detected in the several sections examined.

SUMMARY.

The case was not one where gall-bladder disease was suspected.
The organisms obtained from the diseased tonsils when injected into a rabbit did not produce any disease whatever.

Case No: 13,

NAME. MacGregor, Iza Mrs. AGE. 45
ADMITTED. 8.7.29. OCCUPATION. House-wife.
COMPLAINT. "repeated tonsillitis".

HISTORY,

Patient had her tonsils "cut" 26 years ago. For the past ten years or so her throat has been troubling her again. She gets attacks of tonsillitis very frequently during the winter season.

In 1917 patient was operated upon in the R.I.E. by Mr Miles for gall-stones. She had an attack of jaundice accompanied by fever and gall-stone colic. At operation 5 big stones were removed whilst the gall-bladder was not removed.

Patient has had no trouble with it ever since. Her appetite is good. Except for a little feeling of discomfort after food or nausea at night time patient complains of no digestive trouble.

ON EXAMINATION.

TEETH. all artificial.

TONSILS. Left tonsil was enlarged and red.

ABDOMEN. Patient very obese. On palpation no abnormal tenderness was detected in the gall-bladder area.

OPERATION. 8.7.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY.

A profuse growth of non-haemolytic streptococci was obtained. The growth on the blood plates was of two kinds. Pure cultures were obtained. One giving white and the other giving a green growth on the chocolate medium.

- (a) This organism was S. SALIVARIUS.
 (b) This organism although fermented Lactose also fermented Aeschulin. It was heat resistant and grew on the MacConkey's medium.
 This organism was therefore called ENTEROCOCCUS.

ANIMAL INOCULATION.

RABBIT NO: 13 A was inoculated with S.
 SALIVARIUS.

15.7.29.	5.0 c.c.	of the suspension of organisms		
		in saline.		
20.7.29.	5.0 c.c.	"	"	"
29.7.29.	5.0 c.c.	"	"	"
30.7.29.	5.0 c.c.	"	"	"
10.8.29.	5.0 c.c.	"	"	"
15.8.29.	5.0 c.c.	"	"	"
27.8.29.	5.0 c.c.	"	"	"
5.9.29.	5.0 c.c.	"	"	"
11.9.29.	5.0 c.c.	"	"	"

In all 9 injections were given. The animal lost in weight and died on the 14.9.29.

17.9.29. The post mortem examination was done.

The heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder normal.

- GALL-BLADDER. (a) NAKED EYE. showed p.m. changes in the form of discoloration.
 (b) SECTION. (i) H & E. P.M. changes, no thickening of the wall.
 (ii) GRAM. No organisms seen in several sections examined.

SUMMARY.

No cholecystitis produced in the animal. No other organs effected.

RABBIT/

RABBIT NO: 13 B. inoculated with Enterococcus.

15.7.29.	5.0 c.c.	of the suspension of organisms		
			in saline.	
20.7.29.	5.0 c.c.	"	"	"
25.7.29.	5.0 c.c.	"	"	"
30.7.29.	5.0 c.c.	"	"	"
10.8.29.	5.0 c.c.	"	"	"
15.8.29.	5.0 c.c.	"	"	"
27.8.29.	5.0 c.c.	"	"	"
5.9.29.	5.0 c.c.	"	"	"
11.9.29.	5.0 c.c.	"	"	"
17.9.29.	5.0 c.c.	"	"	"
24.9.29.	5.0 c.c.	"	"	"
1.10.29.	5.0 c.c.	"	"	"

In all 13 injections were given.
The animal lost weight considerably so much so that it had to be killed.

7.10.29. The animal was killed with chloroform.

On post mortem examination the heart, lungs, stomach and intestine, appendix, spleen, kidneys and the urinary bladder were normal.

- GALL-BLADDER. (a) NAKED EYE. showed slight thickening of the wall. Three red spots were very prominent and appeared to be haemorrhaged.
- (b) SECTIONS. Showed very slight increase in the thickness of the wall. There was no cellular infiltration. Luschka's cysts were present. See micro-photograph.

SUMMARY.

Case is a definite one of chronic cholecystitis. The diseased tonsils gave a mixed growth. When injected into two rabbits separately S. Salivarius did not produce any lesions what so ever.

Luschka's cysts although an indication of chronic inflammation was not enough evidence to declare the rabbit no: 13 B cholecystitis was produced.

Case No: 14.

NAME. Duncan, Mr. Harcourt. AGE. 25.

ADMITTED. 10.7.29.

OCCUPATION. Clerk.

COMPLAINT. "Rheumatism".

HISTORY.

In March 1929 patient had an attack of quinsy. Ever since he has been having attacks of muscular rheumatism. His joints get stiff. Usually the big joints are affected.

Patient never had acute rheumatic fever.

Patient never at any time suffered from any digestive trouble. Never had jaundice. No appendicitis.

ON EXAMINATION.

Teeth. in good condition.

Tonsils. Both tonsils hypertrophied. The right one being specially septic.

Abdomen. Perfectly normal. No tenderness in the gall-bladder area even on deep palpation.

OPERATION.

10.7.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia by dissection in the usual way.

BACTERIOLOGY.

Profuse growth was obtained from the tonsils. The organisms were a pure growth of nonhaemolytic streptococci. They fermented Aeschulin and no other sugar (see table). They were heat resistant; and grew on MacConkey's medium. The organism was therefore called Enterococcus.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 14 was inoculated as follows:-

20.7.29.	5.0.c.c. of the suspension of organisms			
			in saline.	
25.7.29.	5.0.c.c.	"	"	"
30.7.29.	5.0.c.c.	"	"	"
12.8.29.	5.0.c.c.	"	"	"
15.8.29.	5.0.c.c.	"	"	"
27.8.29.	5.0.c.c.	"	"	"
31.8.29.	5.0.c.c.	"	"	"
5.9.29.	5.0.c.c.	"	"	"
11.9.29.	5.0.c.c.	"	"	"
17.9.29.	5.0.c.c.	"	"	"
24.9.29.	5.0.c.c.	"	"	"
11.10.29.	5.0.c.c.	"	"	"

In all 12 injections were given.
The animal died 23 days after the last injection.

24.10.29. The animal died. The post mortem examination was done on the same day.

Heart, stomach and intestine, appendix, kidneys and urinary bladder were normal.

LUNGS. Pneumonia.

GALL-BLADDER. (a) Naked Eye. slight opacity.
The walls not thickened.
(b) Section. (i) H & E. showed P.M. changes. The mucous membrane was broken down. There was no cellular infiltration and no thickening of the wall.
(ii) Gram. No organisms were seen in the several sections examined.

SUMMARY. The case was not one of cholecystitis. The organisms obtained from the septic tonsils when injected into a rabbit did not produce any changes in the gall-bladder of the rabbit. The animal died of pneumonia which was not caused by the organisms injected.

Case No: 15.

NAME. Miller, Mrs.

AGE. 42.

ADMITTED. 10.7.29.

OCCUPATION. House-wife.

COMPLAINT. "Cough and irritation of throat".

HISTORY.

Patient has been suffering from a bad throat and cough for several years.

All her teeth were removed 2 years ago.

Patient complains of a vague pain in the right hypochondrium near the costal margin. (gall-bladder area). The pain is gnawing in character. She never had the typical gall-stone colic. She also complained of flatulent dyspepsia.

Patient never had jaundice.

ON EXAMINATION.

Teeth. All artificial.

Tonsils. Both the tonsils were enlarged and septic.

Abdomen. There was a definite tenderness on palpation in the gall-bladder region.

OPERATION.

10.7.29. Dr. Martin.

Both the tonsils were removed by dissection in the usual way under a local anaesthetic.

BACTERIOLOGY.

Profuse growth was obtained from the tonsils. The organisms were non-haemolytic; fermented Aesculin; were resistant to heat, and grew on MacConkey's medium. (see table).

The organism was therefore called Enterococcus.

ANIMAL INOCULATION.

RABBIT NO: 15 was inoculated as follows:-

20.7.29. 5.0.c.c. of the suspension of organisms in saline.

25.7.29.	5.0.c.c.	"	"	"
30.7.29.	5.0.c.c.	"	"	"
10.8.29.	5.0.c.c.	"	"	"
15.8.29.	5.0.c.c.	"	"	"
27.8.29.	5.0.c.c.	"	"	"
31.8.29.	5.0.c.c.	"	"	"
5.9.29.	5.0.c.c.	"	"	"
11.9.29.	5.0.c.c.	"	"	"
17.9.29.	5.0.c.c.	"	"	"
24.9.29.	5.0.c.c.	"	"	"

In all 12 injections were given. The animal was allowed to live. The animal died on 19.10.29.

19.10.29. The post mortem examination was done. The animal had lost considerably in weight.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder were normal.

GALL-BLADDER.

- (a) NAKED EYE. Slight opacity but no definite thickness of the wall.
- (b) SECTION. (i) H & E. showed slight thickening of the wall. But there was no cellular infiltration.
(ii) Gram. No organisms were seen in the several sections examined.

SUMMARY.

The case was one that suggested chronic cholecystitis. The diseased tonsils gave a pure growth of enterococci. These organisms when injected into a rabbit over a very long period failed to produce any definite lesions in any organ of the animal. No cholecystitis was produced.

Case No: 16.

NAME. Hayden, Mrs.

AGE. 28.

ADMITTED. 15.7.29.

OCCUPATION. House-wife.

COMPLAINT. "Heart trouble".

HISTORY.

Patient was admitted to Ward 24 for shortness of breath. She had an attack of rheumatic fever several years ago and ever since her heart has been "weak".

For the past 2 years patient has had simple goitre.

While in the Ward 24 she had an attack of tonsillitis and was therefore advised to get her tonsils removed. Patient does not remember whether her throat has been giving her any particular trouble in the past.

Patient has had no digestive trouble of any kind.

ON EXAMINATION.

TEETH. fairly good.

TONSILS. slight enlargement.

ABDOMEN. Nil to note.

HEART. A presystolic murmur in the mitral area, accentuated pulmonary second.

OPERATION.

15.7.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY.

A profuse growth of a non-haemolytic streptococcus was obtained from both the tonsils. The organism being an Enterococcus. It was heat resistant, fermented aechulin and grew on MacConkey's medium.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 16. was inoculated as follows:-

20.7.29.	5.0.c.c.	of the suspension of organisms		
		in saline.		
25.7.29.	5.0.c.c.	"	"	"
30.7.29.	5.0.c.c.	"	"	"
10.8.29.	5.0.c.c.	"	"	"
15.8.29.	5.0.c.c.	"	"	"
27.8.29.	5.0.c.c.	"	"	"
31.8.29.	5.0.c.c.	"	"	"
5.9.29.	5.0.c.c.	"	"	"
11.9.29.	5.0.c.c.	"	"	"
17.9.29.	5.0.c.c.	"	"	"
24.9.29.	5.0.c.c.	"	"	"
1.10.29.	5.0.c.c.	"	"	"

In all 12 injections were given. The animal was allowed to live 6 weeks afterwards.

11.11.29. The animal was killed by chloroform. The post mortem examination was done.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder normal.

GALL-BLADDER. (a) NAKED EYE. the wall was not thickened.

(b) SECTION. (i) H & E. Showed no increase in the thickness of the wall. No cellular infiltration.

(ii) Gram. No organisms were seen in the several sections examined.

SUMMARY.

The case was not one of cholecystitis. The patient had mitral stenosis and goitre.

The organisms obtained from the diseased tonsils when injected into a rabbit produced no lesions whatever.

Case No: 17.

NAME. Lindsay, Mrs. Katharine. AGE. 31.
ADMITTED. 15.7.29. OCCUPATION. House-wife.
COMPLAINT. "Pyelitis".

HISTORY

Patient had an attacks of facial paralysis some years ago. In January she developed phlebitis in the right leg. She suffered from it till April when she got perfectly well. Seven weeks ago she was admitted to Ward 24. She was sent in as a case of pneumonia and pleurisy. On examination it was found that she was suffering from pyalitis, for which she was treated.

4 days before she was sent to the R.I.E. she had an attack of jaundice.

On the 5th of June 1929 while in the hospital she had phlebitis of the leg.

5 weeks ago she had two attacks of acute tonsillitis.

Patient had no digestive complaint.

ON EXAMINATION. TEETH. bad.
TONSILS. enlarged and septic.
ABDOMEN. there was no tenderness on deep palpation in the gall-bladder area.

OPERATION. 15.7.29. Dr. Martin.
 Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY. Profuse growth of a non-haemolytic streptococcus was obtained from the extirpated tonsils. The organism being S.non-haemolyticus I.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 17. was inoculated as follows:-

20.7.29.	5.0.c.c. of the suspension of organisms		
			of saline.
25.7.29.	5.0.c.c.	"	" "
30.7.29.	5.0.c.c.	"	" "
10.8.29.	5.0.c.c.	"	" "
15.8.29.	5.0.c.c.	"	" "
27.8.29.	5.0.c.c.	"	" "
31.8.29.	5.0.c.c.	"	" "
5.9.29.	5.0.c.c.	"	" "
11.9.29.	5.0.c.c.	"	" "
17.9.29.	5.0.c.c.	"	" "
24.9.29.	5.0.c.c.	"	" "

1.10.29. 5.0.c.c. of the suspension of organisms in saline.

In all 12 injections were given. The animal was allowed to live for 6 weeks afterwards.

11.11.29. The animal was killed by chloroform.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder were normal.

GALL-BLADDER. (a) NAKED EYE. a beautiful specimen of a pearly white gall-bladder. Its walls were thickened. The contents appeared to be mucous. (see water colour drawing).

(b) SECTION. No sections were taken as the specimen was mounted entire.

SUMMARY.

This case was not one of cholecystitis. The organisms obtained from the diseased tonsils when injected into the rabbit produced a definite lesion in the gall-bladder.

No other organs were affected.

Case No: 18.

NAME. Freel, Mr, Charles. AGE. 41.

ADMITTED. 26.7.29. OCCUPATION. Labourer.

COMPLAINT. "Sore-throat for 13 years".

HISTORY.

Patient has been troubled with sore-throats for the past 13 years. Every year about May or June or sometimes twice a year patient gets attacks of tonsillitis.

Patient has had no digestive trouble. His appetite is good. Does not suffer from any dyspeptic symptoms. He never had jaundice.

ON EXAMINATION.

Teeth. Some require extraction.

Tonsils. Both the tonsils were enlarged and septic.

Abdomen. There was no tenderness on deep palpation in the gall-bladder area. Nothing else to note.

OPERATION.

26.7.29.

Dr. Stewart.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY.

Abundant growth of a non-haemolytic streptococcus was obtained from the extirpated tonsils. The organism was heat resistant, fermented lactose and aesculin and grew on MacConkey's medium and was therefore called enterococcus.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 18. was inoculated as follows:-

30.7.29.	5.0.c.c.	of the suspension of organisms		
			in saline.	
12.8.29.	5.0.c.c.	"	"	"
15.8.29.	5.0.c.c.	"	"	"
27.8.29.	5.0.c.c.	"	"	"
31.8.29.	5.0.c.c.	"	"	"
5.9.29.	5.0.c.c.	"	"	"
11.9.29.	5.0.c.c.	"	"	"
17.9.29.	5.0.c.c.	"	"	"
29.9.29.	5.0.c.c.	"	"	"
1.10.29.	5.0.c.c.	"	"	"
7.10.29.	5.0.c.c.	"	"	"
15.10.29.	5.0.c.c.	"	"	"

In all 12 injections were given.
The animal lived for nearly two weeks
afterwards when it was found dead on the
27.10.29.

28.10.29. Post mortem
examination was done. The animal was very
greatly emaciated.

Heart, lungs, stomach and
intestine, appendix, spleen, kidneys and
urinary bladder were normal.

GALL-BLADDER. (a) NAKED EYE. was very large. About
two and a half times
the normal. The walls
were not thickened.
The bile inside it was
of normal consistency
and appearance.
(b) SECTION. (i) H & E. The mucous
membrane was broken
down. The wall was
not thickened. There
was no cellular in-
filtration.
(ii) Gram. No organisms
were seen in the sever-
al sections examined.

SUMMARY.

This case was not one of cholecy-
stitis. The organisms obtained from the
diseased tonsils when injected into a
rabbit did not produce any lesions at all.

Rabbit's gall-bladder was extremely
large.

Case No: 19.NAME. Wilson, Mr. Robert. AGE. 24.ADMITTED. 29.7.29. OCCUPATION. Clerk.COMPLAINT. "sore throat".HISTORY.

Patient has suffered from repeated attacks of tonsillitis ever since his childhood. For the past five or six years he has been very bad.

Patient complained of no other symptoms. His appetite is good and has no pain of any kind. Never had jaundice.

No rheumatism or any other disorder.

ON EXAMINATION.TEETH. Good.

TONSILS. Both the tonsils were enlarged and congested. The left one being particularly septic.

ABDOMEN. No tenderness in the gall-bladder area. Nil to note.

OPERATION.

29.7.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY.

A pure growth of S. Salivarius was obtained. (see table).

ANIMAL INOCULATION.

RABBIT NO: 19 was inoculated as follows:-

12.8.29.	5.0.c.c. of the suspension of organisms of saline.		
15.8.29.	5.0.c.c.	"	"
27.8.29.	5.0.c.c.	"	"
31.8.29.	5.0.c.c.	"	"
5.9.29..	5.0.c.c.	"	"
11.9.29.	5.0.c.c.	"	"
17.9.29.	5.0.c.c.	"	"
29.9.29.	5.0.c.c.	"	"
1.10.29.	5.0.c.c.	"	"
7.10.29.	5.0.c.c.	"	"
15.10.29.	5.0.c.c.	"	"
22.10.29.	5.0.c.c.	"	"

In all 12 injections were given. The animal was allowed to live till it died on 15.11.29. i.e. 3 weeks after the last injection.

15.11.29. The post mortem examination was done. The animal was found to be greatly emaciated.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and the urinary bladder were normal.

GALL-BLADDER, (a) NAKED EYE. Nil to note.
(b) SECTION. (i) H & E. The sections showed no increase in the thickness of the wall. The mucous membrane was broken down. There was no cellular infiltration.
(ii) Gram. No organisms were seen in the several sections examined.

SUMMARY. This case was not one of cholecystitis. The organisms obtained from the diseased tonsils when injected into a rabbit did not produce any lesions whatever.

Gall-bladder was not affected.

Case No: 20.

NAME. Wilkie, Mrs. Margaret AGE 42.

ADMITTED. 29.7.29. OCCUPATION. House-wife.

COMPLAINT. "Sore-throat".

HISTORY.

Patient has suffered repeated attacks of tonsillitis during the past ten years. She often gets colds and coughs during the winter time.

In 1923 patient was in the R.I.E. when Professor Watson performed pan-hystarectomy for fibroids. Her appendix was also removed at the time.

Recently patient had three febrile attacks accompanied by jaundice. Patient gave no history of gall-stone colic. She suffered from flatulent dyspepsia.

ON EXAMINATION.

TEETH. All her teeth were removed 20 years ago.

TONSILS. Both the tonsils were enlarged and septic.

ABDOMEN. On deep palpation there was slight tenderness in the gall-bladder area.

OPERATION. 29.7.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY.

A profuse growth was obtained from the tonsils. The organisms being non-haemolytic, heat resistant, aesculin and lactose fermenters. They grew on MacConkey's medium.

The organism was called Enterococcus.

ANIMAL INOCULATION.

RABBIT NO: 20A was inoculated as follows:-

12.8.29.	5.0.c.c. of the suspension of organisms		
		in saline.	
15.8.29.	5.0.c.c.	"	"
27.8.29.	5.0.c.c.	"	"

The animal died on 1.9.29.

5.9.29. The post mortem examination was done.

Heart, stomach and intestine, appendix, kidneys and urinary bladder were normal.

Lungs showed signs of pneumonia. The spleen was enlarged.

GALL-BLADDER. (a) NAKED EYE. was fleshy looking, It was full of thick puslike material. The walls were very greatly thickened. (See water colour drawing).

(b) SECTIONS. (i) H & E . Showed marked thickness of the wall. No cellular infiltration. The mucous membrane was broken in parts.
(ii) Gram. Showed Gram positive streptococci in chains. (See the micro-photograph).

RABBIT NO: 20B. was inoculated as follows:-

15.10.29.	3.0.c.c.	of the suspension of organisms		
			in saline.	
22.10.29.	4.0.c.c.	"	"	"
28.10.29.	5.0.c.c.	"	"	"
5.11.29.	5.0.c.c.	"	"	"
10.11.29.	5.0.c.c.	"	"	"
18.11.29.	5.0.c.c.	"	"	"
25.11.29.	5.0.c.c.	"	"	"
3.12.29	5.0.c.c.	"	"	"

In all 10 injections were given. The animal was greatly emaciated.

4.12.29. The animal was killed with chloroform. P.M. was done.

Heart, lungs, intestine and stomach appendix, kidneys and urinary bladder were normal. The spleen was enlarged.

GALL/

- GALL-BLADDER. (a) NAKED EYE. was small and opaque. The walls were thickened. The contents were normal.
- (b) SECTIONS. (i) H & E. The mucous membrane was in tact, There was a great deal of cellular infiltration. (See micro- photograph).
- (ii) GRAM. No organisms were seen in the several sections examined.

SUMMARY. The case was one of suspected cholecystitis. The organisms obtained from the diseased tonsils when injected into two rabbits produced a definite lesion in the gall-bladder of the animal.

No other organs being affected.

NOTE. Attempts were made to get organisms from the gall-bladder of the animal 20A. A profuse growth of B. coli and a streptococcus was obtained. I was unable to separate these two organisms.

Case No: 21.

NAME. Dogra, Dr.P.N. AGE. 38

OCCUPATION. Physician and surgeon.

COMPLAINT. "Tooth Abscess".

HISTORY.

Patient had an attack of stomatitis in 1926. This was treated with antiseptics. Two more attacks occurred later on. The tooth abscess was X-rayed and a definite cavity discovered. The tooth however was not extracted.

A few months later patient developed a fever lasting for 10 weeks. The fever was wavy in character clinically resembling typhoid. Widal negative. Cultures from faeces and urine also negatives. After 4 weeks illness patient developed an enlarged gall-bladder with some pain locally. This subsided without any treatment.

Since patient has had 3 or 4 attacks of pain in the epigastrium accompanied by fever and jaundice.

In 1929, while in London, patient one morning after a heavy breakfast had a very severe pain. A febrile attack followed accompanied by jaundice. There was tenderness in the region of the gall-bladder. This passed off in 4 or 5 days.

CHOLECYSTOGRAM.

No gall-bladder shadows were seen. The case was diagnosed as one of cholecystitis. Medical treatment was advised by a physician.

20.8.29. A small quantity of pus was squeezed out of the tooth abscess and taken on to a platinum loop. This was transferred into 1% glucose broth.

BACTERIOLOGY.

A profuse growth of an enterococcus was obtained.
(See Table)

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 21 was inoculated as follows:-

27.8.29.	5.0 c.c. of the suspension of organisms in saline.		
31.8.29.	5.0 c.c.	"	" "
21.9.29.	5.0 c.c.	"	" "
1.10.29.	5.0 c.c.	"	" "
22.10.29.	5.0 c.c.	"	" "
28.10.29.	5.0 c.c.	"	" "
5.11.29.	5.0 c.c.	"	" "
12.11.29.	5.0 c.c.	"	" "

In all 8 injections were given. The animal was allowed to live for 2 weeks afterwards.

25.11.29. The animal was killed with chloroform and the post mortem performed.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder were normal.

GALL-BLADDER.

(a) NAKED EYE. The gall-bladder was thickened. The contents were not normal looking.

(b) SECTIONS. (i) H & E. These sections showed marked increase in the thickness of the wall of the gall-bladder. The mucous membrane was broken down. The section showed definite small cell infiltration.

(ii) GRAM. No organisms were seen in the several section examined.

SUMMARY.

The case was one of chronic cholecystitis. The organisms obtained from the pus of the tooth abscess when injected into a rabbit produced definite gall-bladder disease. No other organs were affected.

Case No: 22.

NAME. McArther, Mrs.

AGE. 49.

ADMITTED. 28.8.29.

OCCUPATION. House-wife.

COMPLAINT. "Prolapse of the uterus".

HISTORY.

Patient is a mother of 6 children. She was admitted to Ward 34 on account of the prolapse of the uterus.

She also complained of vomiting and headache especially after food. She complained of epigastric pain which usually comes about an hour after taking her food. Vomiting relieves the pain.

Patient suffers from chronic constipation and is very greatly troubled with flatulence. She sometimes has heart burn. Never had jaundice or gall-stone colic.

ON EXAMINATION.

Teeth. Bad.

Tonsils. Patient gave no history of any throat trouble. The tonsils were not very grossly diseased.

Abdomen. Definite tenderness in the epigastrium. Deep palpation also elicited tenderness in the gall-bladder area.

OPERATION. 28.8.29. Dr. Martin.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY.

A profuse growth of S. ignavus was obtained. The organisms were heat resistant and fermented aesculin. They however did not grow on MacConkey's medium.

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 22. was inoculated as follows:-

31.8.29.	5.0 c.c.	of the suspension of organisms in		
		saline.		
5.9.29.	5.0 c.c.	"	"	"
11.9.29.	5.0 c.c.	"	"	"
17.9.29.	5.0 c.c.	"	"	"
24.9.29.	5.0 c.c.	"	"	"
1.10.29.	5.0 c.c.	"	"	"
7.10.29.	5.0 c.c.	"	"	"
15.10.29.	5.0 c.c.	"	"	"

In all 9 injections were given. The animal died the following day after the last injection.

16.10.29. The post mortem examination was done. The animal was found to be greatly emaciated.

Heart, lungs, stomach and intestine, appendix, kidneys, and urinary bladder were normal.

Spleen was enlarged and congested.

GALL-BLADDER.

(a) NAKED EYE. The wall was slightly greyish. The contents were normal looking. There was marked thickening of the wall.

(b) SECTIONS. (i) H & E. revealed no thickness of the wall. No cellular infiltration. The mucous membrane was disintegrated.

(ii) GRAM. No organisms were seen in the several sections examined.

SUMMARY.

The case was one where gall-bladder disease was suspected.

The organisms obtained from the diseased tonsils when injected into a rabbit produced no lesions whatever. Gall-bladder was not affected.

Case No: 23.

NAME. McAdam, Mr. Henry, AGE. 32.

ADMITTED. 23.9.29. OCCUPATION. engine
keeper.

COMPLAINT. "Bad throat".

HISTORY. Patient suffered from repeated attacks of tonsillitis ever since his childhood. During the past nine or ten months his throat has been very bad indeed.

During the past 2 or 3 years patient suffered from "indigestion", flatulence, eructations, heart burn etc. He has a slight pain in the epigastrium in addition to a feeling of tightness round the waist.

The pain is made worse by potatoes and other greasy food stuff. Patient thought that his digestive symptoms were worst at the time of an acute tonsillitis.

ON EXAMINATION.

Teeth. Some bad ones in the lower jaw.

Tonsils. Both the tonsils were septic.

Abdomen. There was a definite tenderness in the epigastrium and the gall-bladder area.

OPERATION. 23.9.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY.

A profuse growth of organisms was obtained from the tonsils. A mixed growth of Staphylococci and streptococci was obtained.

S. mitis from the right tonsil; and S. salivarius from the left tonsil.

ANIMAL INOCULATION.

The organisms were mixed before giving the injections.

RABBIT NO: 23A was inoculated as follows:-

1.10.29. 5.0.c.c. of the suspension of organisms in saline.

The/

The animal died 2 days later. Only one injection was given,

3.10.29. Post mortem examination was done.

STOMACH.

On opening the abdomen I was struck by the enormous distension of the stomach. The mucous membrane was congested.

STOMACH SECTIONS. (i) H & E. showed entire mucous membrane. There was marked congestion. No cellular infiltration.
(ii) GRAM. The large blood vessels in the submucous coat showed Gram positive cocci.

GALL-BLADDER. (a) NAKED EYE. No abnormal changes.
(b) SECTIONS. (i) H & E. Normal.
(ii) Gram. No organisms seen.

All the other organs were normal.

RABBIT NO: 23B was inoculated as follows:-

7.10.29. 3.0.c.c. of the suspension of the organisms in saline.

The animal died the following day.

8.10.29. The post mortem examination was done. On opening the abdomen I was struck by the enormous distension of the stomach. It was full of fresh food stuff. The mucous membrane was not much altered.

STOMACH SECTIONS. (i) H & E. The mucous membrane was intact. It showed slight degree of congestion.
(ii) Gram. No organisms were seen in the sections examined.

GALL-BLADDER. (a) NAKED EYE. Patchy opacity of the wall. The contents were normal looking.
(b) SECTIONS. (i) H & E. No thickness in the wall. No cellular infiltration.
(ii) Gram. No organisms seen.

All/

All the other organs were normal.

SUMMARY. The case was one in which gall-bladder and stomach lesions were suspected.

The organisms obtained from the diseased tonsils when injected into two rabbits killed them very quickly and in a similar fashion.

No definite lesions were produced in the stomach or any other organ.

Case No: 24.

NAME. Miss Frazer. AGE. 59.

ADMITTED. 23.9.29. OCCUPATION. Nursing.

COMPLAINT. "Bad throat with diabetes".

HISTORY. Patient has had a very bad throat ever since the War. Shortly after the War she developed diabetes which, however, is controlled by dieting alone.

For the past few years she also had several attacks of Lumbago. Vaccine treatment was tried without any relief.

During the past 3 or 4 years patient has not been keeping well at all. She suffers very badly from flatulence, and dyspepsia. Greasy foods do not agree with her. She often has a feeling of tightness round the waist. Patient gives no history of gall-stone colic or jaundice.

ON EXAMINATION.

Teeth. All artificial.

Tonsils. Both the tonsils were very large and septic.

Abdomen. Patient obese. Abdomen lax. Definite tenderness in the area of the gall-bladder. Nothing else to note.

OPERATION. 23.9.29. Dr. Hall.

Both the tonsils were removed under local anaesthesia in the usual way.

BACTERIOLOGY. A profuse growth of a pure culture of S. Salivarius was obtained from both the tonsils.

ANIMAL INOCULATION.

RABBIT NO: 24A was inoculated as follows:-

1.10.29. 5.0.c.c. of the suspension of organisms in saline.

Only one injection was given and the animal died 6 days afterwards.

7.10.29/

7.10.29. The post mortem examination was done.

Heart, lungs, appendix, spleen, kidneys and urinary bladder were normal.

STOMACH. showed areas of congestion and haemorrhages, Sections of the stomach revealed no ulceration.

GALL-BLADDER. (a) NAKED EYE. Slight opacity. The contents were normal.

(b) SECTIONS. Normal gall-bladder.

RABBIT NO: 24B was inoculated as follows:-

7.10.29.	3.0,c.c.	of the suspension of organisms		
			in saline.	
15.10.29.	4.0,c.c.	"	"	"
22.10.29.	5.0,c.c.	"	"	"
28.10.29.	5.0.c.c.	"	"	"

The animal died on 3.11.29.

5.11.29. The post mortem examination was done.

Heart, lungs stomach and intestine, appendix, spleen kidneys and urinary bladder were normal.

GALL-BLADDER. (a) NAKED EYE. Showed p.m. changes. Contents normal.

(b) SECTIONS. (i) H.& E.. Showed disintegrated m.m. no cellular infiltration no thickness in the wall.

(ii) GRAM. No organisms were seen in the several sections examined.

RABBIT NO: 24C was inoculated as follows:-

5.11.29.	3.0.c.c.	of the suspension of organisms		
			in saline.	
12.11.29.	4.0.c.c.	"	"	"

The animal died 2 days later.

15.11.29. Post mortem examination was done.

Lungs/

LUNGS showed pneumonia. The pleural cavities were full of pus. No sections were cut.

SPLEEN was enlarged and congested.

Gall-bladder, Heart, stomach and intestine, appendix, kidneys and urinary bladder were normal in appearance.

SUMMARY.

The case was one in which chronic cholecystitis was suspected.

A pure growth of *S. Salivarius* obtained from the diseased tonsils. These organisms when injected into three different rabbits failed to produce any changes whatsoever in the gall-bladder.

Pneumonia was produced in the 3rd animal.

Case No: 25.

NAME. Lees, Mrs Sarah. AGE. 50.

ADMITTED. 1.11.29. OCCUPATION. Housewife.

COMPLAINT. "Sore-throat".

HISTORY.

Patient has had trouble with her throat ever since she can remember. She gets regular attacks of tonsillitis.

9 years ago she had two attacks of pain in her stomach. She had temperature as well and was definitely yellow at the time. She was admitted to the R.I.E. where she was operated upon. Her gall-bladder was found to be diseased and was removed. She has had no trouble with her digestion ever since.

Patient is a mother of 13 children.

ON EXAMINATION.

TEETH. All her teeth were very bad and were removed.

TONSILS. Both the tonsils were enlarged and septic.

ABDOMEN. Showed a scar of the gall-bladder operation.

Patient was extremely obese; there was nothing else of interest.

OPERATION . 1.11.29. Dr Hall.

Both the tonsils were removed under ethyl chloride anaesthesia by means of the guillotine.

BACTERIOLOGY. Both the tonsils gave a pure growth of S.SALIVARIUS. (see Table)

ANIMAL INOCULATION .

RABBIT NO: 25A was inoculated as follows:-

5.11.29. 3.0 c.c. of the suspension of organisms in saline.

The animal died the same day.

6.11.29/

6.11.29. The post mortem examination was done.

Heart, lungs, appendix, kidneys and urinary bladder were normal.

STOMACH. Showed areas of congestion and haemorrhages.

SECTION of the STOMACH showed marked congestion and leucocytic infiltration. (See pathology of lesions produced).

GALL-BLADDER. (a) NAKED EYE. Wall not thickened. Contents normal.

(b) SECTIONS. (i) H & E. No evidence of inflammation.

(ii) Gram. No organisms seen in the several sections examined.

RABBIT NO: 25B was inoculated as follows:-

12.11.29	3.0.c.c. of the suspension of organisms			
				in saline.
18.11.29.	4.0.c.c.	"	"	"
25.11.29.	5.0.c.c.	"	"	"
3.12.29.	5.0.c.c.	"	"	"
10.12.29.	5.0.c.c.	"	"	"
18.12.29.	5.0.c.c.	"	"	"

In all 6 injections were given. The animal died 3 days later.

21.12.29. The post mortem examination was done. The animal was emaciated.

Heart, lungs, spleen, appendix, kidneys and urinary bladder were normal.

STOMACH. (a) NAKED EYE. showed two or three areas of haemorrhage.

(b) SECTIONS. (i) H & E. The m.m. showed congestion and early stages of ulcer formation.

(ii) No organisms were seen.

GALL-BLADDER. (a) NAKED EYE. Normal appearance; contents normal looking.

(b) SECTIONS. (i) H & E. The m.m. was broken down There was no cellular-infiltration and no thickening of the wall.

(ii) Gram. No organisms were/

were seen in the several sections examined.

SUMMARY. The case was a definite one of chronic cholecystitis. A profuse and pure growth of *S. salivarius* was obtained from the diseased tonsils. The organisms when injected into two rabbits did not produce any lesions of the gall-bladder. Haemorrhages in the stomach were produced in both the animals.

Case No: 26.

NAME. Clark, Mrs. AGE. 46.
ADMITTED. 8.11.29. OCCUPATION. House-
 wife.
COMPLAINT. "Septic tonsil".

HISTORY.

Patient had been suffering from her digestive trouble for several years now. It consists of her feeling of great discomfort after food, flatulence and a feeling of tightness in the waist. She has had several attacks of spasmodic pain accompanied by jaundice. She had been diagnosed as a case of gallstones and was going to be operated upon after tonsillectomy.

Patient had several attacks of tonsillitis.

ON EXAMINATION.

TEETH. All artificial.
TONSILS. Very large and septic.
ABDOMEN. Nil to note.

OPERATION. 8.11.29. Dr. Hall.
 Only one tonsil was removed entire.
 The other had been "cut" before.

BACTERIOLOGY. Profuse growth of S.non-haemolyticus 1
 was obtained. (See Table).

ANIMAL/

ANIMAL INOCULATION.

RABBIT NO: 26 was inoculated as follows:-

18.11.29.	3.0.c.c.	of the suspension of organisms		
				in saline.
25.11.29.	4.0.c.c.	"	"	"
10.12.29.	4.0.c.c.	"	"	"
18.12.29.	4.0.c.c.	"	"	"
24.12.29.	4.0.c.c.	"	"	"
31.12.29.	4.0.c.c.	"	"	"
7.1.30.	5.0.c.c.	"	"	"
15.1.30.	5.0.c.c.	"	"	"
21.1.30.	5.0.c.c.	"	"	"

In all 9 injections were given. The animal lost in weight and was very weak.

24.1.30. The animal was killed with chloroform. The post mortem examination carried out immediately afterwards.

Heart, lungs, stomach and intestine, appendix, spleen, kidneys and the urinary bladder were normal.

GALL-BLADDER. (a) NAKED EYE. Normal in appearance and contents.
 (b) SECTIONS. (i) H & E. Mucous membrane normal the wall not thickened. No cellular infiltration.
 (ii) Gram. No organisms seen in the several sections examined.

SUMMARY. The case was one of gall-bladder disease. The septic tonsil gave a growth of a non-haemolytic streptococcus which on injection in a rabbit produced no lesions what so ever.

CASES OF GALL-BLADDER DISEASE
ON WHOM
TONSIL PUNCTURE WAS PERFORMED

Case No. 1.NAME. ROSS, Mrs Jeanie,AGE, 24. OCCUPATION, House-wife.ADMITTED. 23.10.29.COMPLAINT. Attacks of acute abdominal pain.
Duration. 8 months.HISTORY.

At Christmas time patient was treated with thyroid extract for obesity. It was immediately after that that she first complained of the pain. The attack came on without any warning and was so severe as to double her up. It began in the mid-line and passed out under the right costal margin. It lasted about $\frac{3}{4}$ of an hour and then suddenly passed off. The pain never went to the back.

Two days later patient felt a pain in the right groin which lasted about a day. She has had similar attacks at varying intervals from a fortnight to two months.

Patient was jaundiced after one attack. She has often been troubled with flatulence. No heartburn; no waterbrash.

ON EXAMINATION.

Teeth. good.

Tonsils. Both tonsils were fairly normal to look at. Patient had no definite history of repeated throat trouble. She only had one attack of tonsillitis.

Abdomen. There was tenderness on palpation just under the right costal margin about 4" from the mid-line. No enlargement of the liver or spleen.

CHOLECYSTOGRAM. Positive indication of a pathological gall-bladder.

OPERATION. 25.10.29. Mr. Cochrane.

The gall-bladder showed signs of chronic inflammation. Gall-stones were found. The stomach and duodenum were healthy. The appendix also showed signs of chronic inflammation.

Cholecystectomy/

Cholecystectomy and appendicectomy were carried out.

SECTION OF THE GALL-BLADDER. Cholecystitis.

No growth of organisms was obtained from the gall-bladder wall or the cystic gland.

TONSIL PUNCTURE. 25.10.29. Tonsil puncture was performed after the operation in the usual manner.

A profuse growth of (a) Staphylococcus (b) S. salivarius was obtained. (Table)

ANIMAL INOCULATION.

RABBIT NO: 36 was inoculated as follows:-

29.10.29.	3.0.c.c. of the suspension of organisms			
			in saline.	
5.11.29.	4.0.c.c.	"	"	"
12.11.29.	5.0.c.c.	"	"	"
18.11.29.	5.0.c.c.	"	"	"
25.11.29.	5.0.c.c.	"	"	"
3.12.29.	5.0.c.c.	"	"	"

In all 6 injections were given. The animal lost considerably in weight and then died.

4.12.29. The post mortem examination was done. Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder, the big joints were normal.

GALL-BLADDER.

(a) NAKED EYE. Very small. Slightly opaque. Contents normal.

(b) SECTIONS. (i) H & E. The m.m. was disintegrated. There was no thickness of the wall and no cellular infiltration.

(ii) GRAM. No organisms were seen in the several sections examined.

RABBIT NO: 37 was inoculated as follows:-

18.11.29.	3.0.c.c. of the suspension of organisms	
		in saline.

The/

19.11.29. The animal died the following day.
The post mortem examination was done.
Heart showed pericarditis, the endocardium was normal.
Lungs showed marked pneumonia. Spleen was enlarged and congested. Stomach and intestine, appendix, kidneys and the urinary bladder and the big joints were normal.

GALL-BLADDER. (a) NAKED EYE. Normal in size and appearance.

(b) SECTIONS. (i) H & E. The m.m. was destroyed. No cellular infiltration.

(ii) GRAM. No organisms were seen in the several sections examined.

RABBIT NO: 38 was inoculated as follows:-

25.11.29.	3.0.c.c. of the suspension of organisms			
			in saline.	
3.12.29.	4.0.c.c.	"	"	"
10.12.29.	4.0.c.c.	"	"	"

Only 3 injections were given and the animal died.

12.12.29. The post mortem examination was done.
Heart, lungs, stomach and intestine, appendix, kidneys and urinary bladder and the big joints were normal.
The spleen was enlarged and congested.

GALL-BLADDER. (a) NAKED EYE. Normal in appearance and size. Contents normal.

(b) SECTIONS. (i) H & E. The m.m. was intact, no cellular infiltration or thickening of the wall.

(ii) GRAM. No organisms were seen in the several sections examined.

SUMMARY. Case was one of definite cholecystitis and appendicitis. No history of tonsillitis. The organisms obtained from the tonsils when injected into 3 rabbits produced no changes in the gall-bladder or the appendix.

Case No: 2.

NAME. JENKINS. Mrs Mary,

AGE. 27. OCCUPATION. House-wife.

ADMITTED. 2.11.29.

COMPLAINT. Stomach trouble for the past 3 years.

HISTORY.

Patient has had several attacks of upper abdominal discomfort and pain during the last three years. During the attacks she experiences a feeling of weight across the epi-gastrium, and the pain shoots through to the back. No shoulder pain. During the attack she sweats and feels weak. She says she has never been jaundiced.

She has had five attacks in all. The last 3 occurred in the first three months of 1929. The last one being in March.

The patient states that she has had a great deal of trouble with 'wind in the stomach' during the last 3 years. This occurs especially after certain foods e.g. potatoes. She suffers from a feeling of tightness in the epigastrium when she has flatulence.

ON EXAMINATION.

TEETH. in perfectly good condition.

TONSILS. Patient gives no history of any throat trouble. In the beginning of this year she had an attack of 'throat trouble'. Both her tonsils look fairly normal.

ABDOMEN. No definite area of tenderness was noticed. Gall-bladder region was insensitive. There was nothing else to note.

CHOLECYSTOGRAM.

Evidence of gall-bladder lesion.

OPERATION. 8.11.29. Mr. Cochrane.

The stomach and duodenum were healthy. The liver and gall-bladder were found to be very high up under the costal margin. The gall-bladder wall was not markedly thickened, and no gall-stones were present. Gall-bladder/

bladder was, however, found sufficiently diseased to require removal.

SECTION OF THE GALL-BLADDER. Cholecystitis.

No growth of organisms was obtained from the gall-bladder wall or the cystic lymph gland.

TONSIL PUNCTURE. was performed after the operation in the usual way on 8.11.29.

A pure growth of *S. salivarius* was obtained. (See Table)

ANIMAL INOCULATION.

RABBIT NO: 39 was inoculated as follows:-

18.11.29.	3.0.c.c. of the suspension of organisms			
			in saline.	
25.11.29.	4.0.c.c.	"	"	"
3.12.29.	4.0.c.c.	"	"	"
10.12.29.	4.0.c.c.	"	"	"
18.12.29.	5.0.c.c.	"	"	"

In all 5 injections were given, The animal died 5 days later

23.12.29. The post mortem examination was done. Heart, lungs, intestine and appendix, the urinary bladder and the big joints were normal.

STOMACH. (a) NAKED EYE. Showed haemorrhages and one area of acute congestion and inflammation.
(b) SECTIONS. (i) H & E. Showed marked congestion. Small cell infiltration round the glands of the stomach. (See Pathology of the lesions produced).

L. KIDNEY. (a) NAKED EYE. Enlarged.
(b) SECTIONS. (i) H & E. Marked congestion of the cortex. Small cell infiltration both in the cortex and the medulla. The collection of cells was chiefly perivascular.
(ii) GRAM. Gram positive cocci were seen in large numbers.

R. KIDNEY. (a) NAKED EYE. Nil to note.
(b) SECTIONS. (i) H & E. Slight congestion. nothing else to note.
(ii) GRAM. No organisms seen.

GALL-BLADDER. (a) NAKED EYE. Normal in appearance. Contents normal.
(b) SECTIONS. (i) H & E. The m.m. destroyed. No cellular infiltration, no thickening/

thickening of the wall.

(ii) No organisms were seen in the several sections examined.

RABBIT NO: 40. was inoculated as follows:-

18.11.29. 3.0.c.c. of the suspension of organisms
in saline.
25.11.29. 4.0.c.c. " " "

Only 2 injections were given. The animal died the following day.

26.11.29. The post mortem examination was done.
Heart, lungs, stomach and intestine, appendix, spleen, kidneys and urinary bladder and the big joints were normal.

GALL-BLADDER. (a) NAKED EYE. Small and opaque in appearance.
(b) SECTIONS. (i) H & E. The m.m. was destroyed. Slight p.m. changes.. No thickening of the wall. No cellular infiltration.

RABBIT NO: 41 was inoculated as follows:-

3.12.29. 3.0.c.c. of the suspension of organisms in
saline.
The animal died 5 days later.

8.12.29. The post mortem examination was done.
Heart, stomach and intestine, appendix, kidneys, urinary bladder and the big joints were normal.

LUNGS. showed pneumonia.

GALL-BLADDER. (a) NAKED EYE. Nil to note.
(b) SECTIONS. The m.m. was destroyed.
No cellular infiltration and no thickening of the wall.

SUMMARY. The case was one in which gall-bladder was diseased.

All the other organs were normal.

Tonsils were normal looking and patient gave no history of tonsillitis.

The organisms were obtained in a pure culture. On injection into 3 rabbits different lesions were produced. No cholecystitis occurred however.

In R. 39 ulceration of the stomach and inflammation in the left kidney.

In R. 40. no lesions at all.

In R. 41 Pneumonia,

CHOLECYSTOGRAM. Negative. Gall-bladder well outlined. The duodenal cap was regular and not tender.

OPERATION. Exploration of the abdomen revealed the scar of an old ulcer, which was not causing stenosis.

The gall-bladder showed an increase in the subserous fat. Its wall was thickened, but no gall-stones were found. The cystic gland was small. Cholecystectomy was performed.

SECTION of the gall-bladder. - Cholecystitis.

No growth of organisms was obtained from the gall-bladder or the cystic lymph gland.

TONSIL PUNCTURE. was performed after operation in the usual manner. A pure growth of *S. salivarius* was obtained.

ANIMAL INOCULATION.

RABBIT NO: 42 was inoculated as follows:-

18.11.29.	3.0.c.c.	of the suspension of organisms			
					in saline.
25.11.29.	4.0.c.c.	"	"	"	
3.12.29.	4.0.c.c.	"	"	"	

In all 3 injections were given. The animal died six days after the last injection.

9.12.29. The post-mortem examination was done.

Heart, lungs, intestine and appendix, stomach, spleen, kidneys and the urinary bladder and the big joints were normal.

GALL-BLADDER. (a) NAKED EYE. normal in appearance.

(b) SECTIONS. (i) H & E. P.M. changes. No Cholecystitis.
(ii) GRAM. No organisms seen in the several sections examined.

RABBIT/

RABBIT NO: 43 was inoculated as follows:-

18.11.29.	3.0.c.c.	of the suspension of organisms			
					in saline.
25.11.29.	4.0.c.c.	"	"	"	"
3.12.29.	4.0.c.c.	"	"	"	"
10.12.29.	4.0.c.c.	"	"	"	"
18.12.29.	4.0.c.c.	"	"	"	"
24.12.29.	4.0.c.c.	"	"	"	"
31.12.29.	4.0.c.c.	"	"	"	"
7. 1.30.	5.0.c.c.	"	"	"	"
15. 1.30.	5.0.c.c.	"	"	"	"
21. 1.30.	5.0.c.c.	"	"	"	"

In all 10 injections were given. The animal lost considerably in weight.

24.1.30. Post mortem examination was done. All the vicere were normal.

GALL-BLADDER. (a) NAKED EYE. nil to note.
 (b) SECTIONS. (i) H & E. m.m. broken down. No evidence of Cholecystitis.
 (ii) GRAM. No organisms seen in the sections examined.

RABBIT NO: 44 was inoculated as follows:-

10.12.29.	3.0.c.c.	of the suspension of organisms			
					in saline.
17.12.29.	3.0.c.c.	"	"	"	"

Only 2 injections were given. The animal died the following day.

18.12.29. Post mortem examination was done.

Heart, lungs, intestine and appendix, Urinary bladder and the big joints were normal.

STOMACH. (a) NAKED EYE. Showed several areas of haemorrhage and a few ulcers.
 (b) SECTIONS. (i) H & E. Showed marked small cell infiltration amongst the glands of the stomach. There was marked congestion
 (ii) GRAM. Gram positive cocci in the region of the abscesses.

SUMMARY. A case of definite cholecystitis. Organisms/

Organisms from the tonsils produced varied lesions.

R 42 and R 43 showed no lesions.

R 44 showed ulcers of stomach and kidney abscesses.

Case No: 4.

NAME. CAMERON. Mrs. Jane,

AGE. 43. OCCUPATION. Housewife.

ADMITTED. 4.11.29.

COMPLAINT. Acute attacks of pain in the right
hypochoondrium accompanied with
sickness.
Duration - 15 years.

HISTORY.

Patient's first attack of the pain occurred 15 years ago. Three years later she had another attack and ever since the attacks have been coming regularly and at increasing frequency. Now they come every few weeks.

They come on without warning and are so severe as to double her up. The pain is situated in the region of the gall-bladder, radiates a little across the epigastrium but chiefly through to the scapula, and recently she has had pain at the tip of the right shoulder.

The attacks are always accompanied by the feeling of sickness and often vomiting, but lately there has only been sickness.

During the past 15 years patient, on several occasions, has noticed that her face and hands become yellow after an attack. She has never noticed the colour of her motions.

Patient has been troubled with flatulence which is aggravated by starchy foods and fats.

Her appendix was removed 20 years ago. In April of this year radium was inserted into the uterus for menorrhagia.

ON EXAMINATION.

TEETH. all teeth removed 20 years ago.

TONSILS. Patient gives no history of sore-throat. Both tonsils were small and of the embedded type.

ABDOMEN. On deep palpitation there is a little tenderness in the region of the/

the gall-bladder, and considerable tenderness in the region of the common bile duct. Liver and spleen not enlarged. Nothing else to note.

CHOLECYSTOGRAM. Definite evidence of a pathological gall-bladder.

OPERATION. 5.11.29. Mr. Illingworth.
The gall-bladder was large and distended. One stone in Hartmann's pouch. The gall-bladder wall was thickened. Stomach and duodenum were normal. Cholecystectomy was performed.

SECTION OF THE GALL-BLADDER. Showed chronic inflammatory changes. No growth of organisms was obtained from the gall-bladder wall or the cystic lymph gland.

Case No: 4.

TONSIL PUNCTURE. 5.11.29. was performed in the usual manner. Profuse growth of (a) Staphylococci. (b) S. Nonhaemolyticus I. was obtained.

ANIMAL INOCULATION.

Rabbit No: 45. was inoculated as follows:-

25.11.29.	3.0 c.c. of the suspension of organisms		
		in saline.	
3.12.29.	4.0	"	"
10.12.29.	4.0	"	"
18.12.29.	4.0	"	"
24.12.29.	4.0	"	"
31.12.29.	4.0	"	"
7. 1.30.	4.0	"	"

In all 7 injections were given. The animal lost considerably in weight and was killed with chloroform.

9.1.30. Post mortem examination was done. Heart, Lungs Stomach and Intestine, Appendix, Spleen, Kidneys and the big joints were normal.

GALL-BLADDER/

GALL-BLADDER. (a) NAKED EYE. Slight opacity of the wall.

(b) SECTION. (i) H & E. Showed marked hyperplasia of mucous membrane. No cholecystitis.

(2) GRAM. No organisms seen.

RABBIT NO: 46. was inoculated as follows:-

25.11.29.	3.0. c.c. of the suspension of organisms		
		in saline.	
3.12.29.	4.0.	"	" "
10.12.29.	4.0.	"	" "
18.12.29.	4.0.	"	" "
24.12.29.	4.0.	"	" "
31.12.29.	4.0.	"	" "
7. 1.30.	5.0.	"	" "
15. 1.30.	5.0.	"	" "
21. 1.30.	5.0.	"	" "

In all 9 injections were given. The animal lost in weight and was killed with chloroform.

7. 2.30. Postmortem examination was done. All the viscera were normal.

RABBIT NO: 47. was inoculated as follows:-

3.12.29.	3.0. c.c. of the suspension of organisms		
		in saline.	
10.12.29.	4.0.	"	" "
18.12.29.	4.0.	"	" "
24.12.29.	4.0.	"	" "
31.12.29.	4.0.	"	" "
7. 1.30.	5.0.	"	" "

In all 6 injections were given and the animal lost in weight and died.

8. 1.30. Postmortem examination was done. All the viscera were examined and found to be normal.

GALL-BLADDER. (a) NAKED EYE. Normal.

(b) SECTION. (i) H & E. no cholecystitis.

(ii) GRAM. no organisms seen/

seen in the several sections examined.

SUMMARY.

A case of definite chronic cholecystitis.

The tonsillar organisms when injected into 3 rabbits produced no pathological changes.

Case No: 5.

NAME. BARR. Mrs Marian,

AGE. 51. OCCUPATION. House-wife.

COMPLAINT. Pain under the right costal margin radiating round to the back and up to the shoulder. Flatulence.
Duration - 3 years.

HISTORY. Patient was perfectly healthy until three years ago when she first began to be bothered with an aching pain just under the right costal margin. The pain went round to the back and up to the right shoulder where it is shooting in character. It is sometimes present on the left side. The pain comes and goes but is always the same kind. She has had no attacks of very severe pain. She has never been yellow, and never had shivering attacks.

Patient is troubled with wind. Occasionally she has had heartburn and water-brash. She does not know if any kind of food upsets her. The pain is sometimes relieved by taking baking soda.

Patient is mother of 8 children. No history of gastric trouble in the family.

ON EXAMINATION.

TEETH. All artificial, removed 15 years ago.

TONSILS. Small, no evidence of disease. Patient gave no history of sore-throat.

ABDOMEN. Slight tenderness on deep palpation under the right costal margin. Nothing else to note.

CHOLECYSTOGRAM. Negative. No stones were shown.

OPERATION. 26.11.29. Professor Wilkie.

On opening the abdomen the liver was found low and slightly nutmeg, suggesting chronic venous congestion. Gall-bladder was opaque and adherent to the transverse colon. No gall-stones. Cystic gland slightly enlarged. All other organs normal.

Early cholecystitis. Cholecystectomy performed.

GALL-BLADDER SECTIONS/

GALL-BLADDER SECTIONS. showed early inflammatory changes. No growth of organisms occurred from the gall-bladder wall or cystic lymph gland.

TONSIL PUNCTURE. 26.11.29. was performed in the usual manner. A profuse growth of *S. salivarius* was obtained.

ANIMAL INOCULATION.

RABBIT NO: 48 was inoculated as follows:-

3.12.29.	3.0.c.c.	of the suspension of organisms	
		in saline.	
10.12.29.	3.0.c.c.	"	" "
18.12.29.	3.0.c.c.	"	" "
24.12.29.	4.0.c.c.	"	" "
31.12.29.	4.0.c.c.	"	" "
7.1.30.	5.0.c.c.	"	" "
18. 1.30.	5.0.c.c.	"	" "
21. 1.30.	5.0.c.c.	"	" "

In all 8 injections were given. The animal emaciated considerably and died.

22.1.30. Post mortem examination was done.
All the viscera were found to be normal.
No joint lesions produced.

RABBIT NO: 49. was inoculated as follows:-

3.12.29.	3.0.c.c.	of the suspension of organisms	
		in saline.	
10.12.29.	3.0.c.c.	"	" "
18.12.29.	3.0.c.c.	"	" "
27.12.29.	4.0.c.c.	"	" "
31.12.29.	4.0.c.c.	"	" "
7. 1.30.	5.0.c.c.	"	" "
15. 1.30.	5.0.c.c.	"	" "

In all 7 injections were given. The animal lost weight and died.

18. 1.30. Post mortem examination was done.

LUNGS. Pneumonia.
All other viscera normal.

RABBIT/N)

RABBIT NO:50. was inoculated as follows:-

3.12.29.	3.0.c.c.	of the suspension of organisms in		
		saline.		
10.12.29.	3.0.c.c.	"	"	"
18.12.29.	3.0.c.c.	"	"	"
24.12.29.	4.0.c.c.	"	"	"
31.12.29.	4.0.c.c.	"	"	"
7. 1.30.	5.0.c.c.	"	"	"
15. 1.30.	5.0.c.c.	"	"	"
21. 1.30.	5.0.c.c.	"	"	"
28. 1.30.	5.0.c.c.	"	"	"

In all 9 injections were given. The animal was greatly emaciated and died.

21. 1.30. Post mortem examination was done,

SPLEEN. was enlarged and congested. All the other viscera were normal.

GALL-BLADDER. (a) NAKED EYE. normal in appearance.
 (b) SECTION. (i) H & E. no evidence of inflammation.
 (ii) GRAM. No organisms seen.

SUMMARY. A definite case of chronic cholecystitis. The tonsillar organisms when injected did not produce any disease of the gall-bladder.

Case No: 6.

NAME: PERMAN. Ernest,

AGE. 48.

ADMITTED. 18.11.29.

COMPLAINT: Abdominal pain. Nausea. Duration -
3 months.

HISTORY.

Patient has never been bothered with his stomach until three months ago when he began to lose his appetite. His wife, during the past two or three weeks, noticed that his colour was yellow. He has also has some nausea for the past two or three weeks.

Patient has lost in weight. He has noticed a lack of energy with definite weakness.

Patient's skin is itchy.

Pleurisy 3 years ago V.D.H. No rheumatic fever.

ON EXAMINATION.

Teeth. Artificial above. Only incisors and canines below.

Tonsils. Patient gives no history of throat trouble. He is not subject to colds. Both the tonsils showed no evidence of disease

Abdomen. Moved well with respiration. Slight resistance in the right-hypo-chondrium.

TEST MEAL. Free HCL 25. Total acidity 60.

BARIUM SERIES.

Examination did not indicate any lesion.

CHOLECYSTOGRAM. Negative.

OPERATION. 26.11.29. Professor Wilkie.

On opening the abdomen the gall-bladder was found to be thickened with increase of/

of subserous fat. No stones were present. All other organs normal. Pancreas was firm and indurated. A cholecystostomy was performed to rest the pancreas.

SECTION OF THE GALL-BLADDER. Showed chronic cholecystitis.

No growth of organisms was obtained from the cystic lymph gland or the gall-bladder wall.

TONSIL PUNCTURE. 26.II.29. was performed in the usual manner. A profuse growth of S. salivarius was obtained.

ANIMAL INOCULATION.

RABBIT No: 51 and 53 were inoculated as follows:-

3.12.29.	3.0.c.c	of the suspension of organisms			
				in saline.	
10.12.29.	3.0.c.c.c.	"	"	"	"
18.12.29.	3.0.c.c.c.	"	"	"	"
24.12.29.	4.0.c.c.c.	"	"	"	"
31.12.29.	4.0.c.c.c.	"	"	"	"
7. 1.30.	5.0.c.c.c.	"	"	"	"
15. 1.30.	5.0.c.c.c.	"	"	"	"
21. 1.30.	5.0.c.c.c.	"	"	"	"

In all 9 injections were given. Both the animals lost weight and died.

6.2.30. Post mortem examination was done. Both animals showed no pathological lesions in any of the organs.

RABBIT NO: 52. was inoculated as follows:-

3.12.29.	3.0.c.c.	of the suspension of organisms			
				in saline.	
10.12.29.	3.0.c.c.c.	"	"	"	"
18.12.29.	3.0.c.c.c.	"	"	"	"
24.12.29.	4.0.c.c.c.	"	"	"	"
31.12.29.	4.0.c.c.c.	"	"	"	"

In all 5 injections were given. The animal died.

2.1.30./

2.1.30.

Post mortem examination was done. All the viscera were normal.

SUMMARY.

A definite case of cholecystitis.
The tonsillar organisms when injected into 3 Rabbits profused no lesion at all.

Case No: 7.

NAME. EDMONDSTONE, Mrs. Sophia,
AGE. 57. OCCUPATION, Housewife.
ADMITTED. 2.12.29.
COMPLAINT. Attacks of pain in the right side.
 Vomiting.
 Duration - $2\frac{1}{2}$ years.

HISTORY. Patient was perfectly well until a little over two years ago except for some slight distension and heartburn with certain foods such as potatoes, marmalade etc. In July 1927 she had just gone to bed one night when she was suddenly seized with an acute pain below the right costal margin, radiating along to the midline, going through to the back and the right shoulder. The attack was accompanied by shivering and vomiting. This lasted for two days and nights. Patient did not notice whether she was yellow at that time or not. She was in bed for 14 days. The acute pain passed off after 2 days leaving a dull aching sensation under the right costal margin.

A month later patient had a similar attack. This however did not last long - only 4 or 5 hours. Since then she has had similar attacks at varying intervals of about 12 months, usually preceded by shivering and followed by a tinge of yellowness.

During the intervals patient feels well and has no symptoms, except that certain foods do not agree with her.

ON EXAMINATION.

TEETH. Removed 20 years ago. All artificial.

TONSILS. Patient gave no history of sore-throats. She is not subject to colds. Both her tonsils were small and atrophied. No evidence of disease.

ABDOMEN. Moves on respiration. Hyperaesthesia in the epigastrium. Tenderness in the region of the gall-bladder. Nothing else to note.

CHOLECYSTOGRAM. Gall-bladder not outlined.

OPERATION./

OPERATION. 6.12.29.

Professor Wilkie.

On opening the abdomen the gall-bladder presented. It was large and tense and thickened. A gall-stone was present in the cystic duct. All the other organs were normal.

Chronic cholecystitis with gall-stone formation. Cholecystectomy was performed, and common bile duct drained.

SECTION OF THE GALL-BLADDER. Showed chronic inflammatory changes.

TONSIL PUNCTURE. 6.12.29. was performed in the usual manner and *S. salivarius* was obtained.

ANIMAL INOCULATION.

RABBITS NO: 55 and 56 were inoculated as follows:-

12.12.29.	2.0.c.c.	of the suspension of organisms	
		in saline.	
19.12.29.	2.0.c.c.	"	"
24.12.29.	3.0.c.c.	"	"
31.12.29.	3.0.c.c.	"	"
7. 1.30.	4.0.c.c.	"	"
15. 1.30.	5.0.c.c.	"	"
21. 1.30.	5.0.c.c.	"	"
28. 1.30.	5.0.c.c.	"	"

RABBIT NO: 54 lost considerably in weight and died.

Post mortem examination was done.

KIDNEYS, large.

SECTIONS. Showed perivascular small. Cell infiltration.

GALL-BLADDER. (a) NAKED EYE. Opaque looking full of thick contents which gave growth of *B. Coli* and a *Streptococcus*.

(b) SECTIONS. (i) H & E. No cholecystitis.

(ii) GRAM. No organisms seen.

RABBIT NO: 55. lost very considerably in weight and died.

Post mortem examination was done.

STOMACH. /

STOMACH. Showed haemorrhages.
All other viscera were normal in appearance.

GALL-BLADDER. (a) NAKED EYE. Showed a pocket like diverticulum at the neck.
(b) SECTIONS. (i) H & E. No cholecystitis.

RABBIT NO:56. did not look very ill but was killed with chloroform.

Post mortem examination was done.

All the viscera were found to be normal.

SUMMARY. A definite case of cholecystitis.
The tonsillar organism when injected into 3 rabbits failed to produce any lesions in the gall-bladder.

Case No: 8.

NAME. SPEEDIE, Mrs Isabella.

AGE. 31.

OCCUPATION. House-wife.

ADMITTED. 3.12.29.

COMPLAINT. Pain in the right side of the stomach.
Duration - 11 years. Worse for the
past six months.

HISTORY. Patient's first attack of pain occurred 11 years ago, six months after the birth of her second child. The pain came on suddenly. It doubled her up. She vomited. The pain was situated under the right costal margin. Vomiting relieved the pain which disappeared in an hour or two. These attacks recurred ever since, often at monthly intervals. They seem to be related to menstruation.

During the past 6 months the attacks have become more frequent and severe. The pain now radiates across the abdomen and the top of the right shoulder blade. She also has pain at the same level at the back. The onset of pain is followed by vomiting which gives relief.

Patient has no heartburn; no flatulence; no pain in relation to food. Extreme degree of constipation.

Patient is mother of 3 children. No stomach trouble in her family.

ON EXAMINATION.

TEETH. Very septic stumps, some carious
TONSILS. Patient is liable to occasional attacks of sore-throats. The last attack was several months ago. There was no relation between an attack of sore-throat and an attack of her abdominal trouble.

Both tonsils looked apparently healthy.

ABDOMEN. Lax, evident loss of weight. Moves freely. Tenderness in the area of the gall-bladder. Nothing else to note.

CHOLECYSTOGRAM. Gall-bladder not outlined. Definite round shadow just above the 12th.rib.

OPERATION. 6.12.29.

On opening the abdomen a small shrivelled gall-bladder adherent to duodenum was found. The common bile duct contained a very big stone which was removed. All the other organs were normal.

Chronic/

Chronic cholecystitis with gall-stone formation.

SECTION OF THE GALL-BLADDER. Showed chronic inflammatory changes. No growth of organisms occurred from the wall of the gall-bladder or the cystic lymph gland.

TONSIL PUNCTURE. 6.12.29. was performed in the usual manner and a mixed growth of organisms obtained. An enterococcus was separated and used for animal inoculation.

ANIMAL INOCULATION.

RABBITS NO: 57, 58 and 59 were inoculated as follows:-

12.12.29.	22.0.c.c.	of the suspension of organisms	
		in saline.	
19.12.29.	2.0.c.c.	"	" "
24.12.29.	3.0.c.c.	"	" "
31.12.29.	3.0.c.c.	"	" "
7. 1.30.	3.0.c.c.	"	" "
15. 1.30.	4.0.c.c.	"	" "
21. 1.30.	5.0.c.c.	"	" "
28. 1.30.	5.0.c.c.	"	" "

In all 8 injections were given. The animal only lost a little in weight. They were all killed with chloroform and post mortem examination performed on 7.2.30.

RABBIT NO: 58. Showed lesions of the left knee joint. Pus was obtained and organisms grown. A non-haemolytic streptococcus was recovered. All the other viscera were normal.

RABBIT NO: 57 and 59. Showed no pathological lesions in any organ whatsoever.

SUMMARY. A definite case of cholecystitis. The tonsillar organisms when injected into 3 rabbits produced no disease of the gall-bladder.

Case No: 9.

NAME. MURRAY, Mrs. Isabel.

AGE. 51. OCCUPATION. House-wife.

ADMITTED. 9,12.29.

COMPLAINT. Pain under right costal margin and vomiting during the past 6 months.

HISTORY.

In July last patient first began to have a slight aching pain under the right costal margin. One night she vomitted blood and had a loose motion which also contained blood. She was kept in bed for a week and later sent to Ward 27.

Patient has never been yellow. She has frequently suffered from a shivery feeling before the pain under the ribs came on. Pain varies. It sometimes passes through the back and up to both shoulders. It has never been very severe.

Patient often feels distended, suffers greatly from waterbrash, acidity and flatulence.

ON EXAMINATION.

TEETH. All artificial. Own teeth removed 6 years ago.

TONSILS. Both small and atrophic. Patient gave no history of any throat trouble.

ABDOMEN. Very obese. Definite tenderness in the gall-bladder region. Nil to note.

CHOLECYSTOGRAM. Examination did not indicate a pathological gall-bladder.

BARIUM SERIES. No evidence of any gross lesion.

OPERATION. 13.12.29. Prof. WILKIE.
Local anaesthesia.

The gall-bladder was high and rather inaccessible. The wall was definitely thickened and opaque. No stones were present. The stomach and duodenum were normal.

Chronic cholecystitis.

Gall-bladder sections showed chronic inflammation. No growth of organisms occurred/

occurred from the gall-bladder or the wall or the cystic lymph gland.

TONSIL PUNCTURE. 13.12.29. was performed in the usual manner and a mixed growth obtained. *S.salivarius* was isolated and used for inoculation.

ANIMAL INOCULATION.

RABBITS NO: 60 and 61 were inoculated as follows:-

24.12.29.	2.0.c.c.	of the suspension of organisms			
					in saline.
31.12.29.	2.0.c.c.	"	"	"	"
7. 1.30.	3.0.c.c.	"	"	"	"
15. 1.30.	3.0.c.c.	"	"	"	"
21. 1.30.	4.0.c.c.	"	"	"	"
28. 1.30.	5.0.c.c.	"	"	"	"
4. 2.30.	5.0.c.c.	"	"	"	"
11. 2.30.	5.0.c.c.	"	"	"	"

In all 8 injections were given. The animals were killed with chloroform.

12. 2.30. Post mortem examination was performed.

SPLEEN. in both animals was enlarged and congested.

All other viscera and the big joints were normal in appearance. The gall-bladder was sectioned and examined in the usual way and was found to be normal in both cases.

RABBIT NO: 62. was inoculated as follows:-

24.12.28.	2.0.c.c.	of the suspension of organisms			
					in saline.
31.12.29.	2.0.c.c.	"	"	"	"
7. 1.30.	3.0.c.c.	"	"	"	"

In all 3 injections were given. The animal died.

8.1.30. Post mortem examination was done.

LUNGS/

LUNGS. Pneumonia.

SPLEEN. was large and congested.

GALL-BLADDER. (a) NAKED EYE. normal.
(b) SECTIONS. (i) H & E. no evidence
of inflammation.

SUMMARY. A definite case of chronic cholecystitis. The tonsillar organisms when injected into 3 rabbits failed to produce any lesions of the gall-bladder.

Case No: 10.

NAME. BONTHRON, Mrs Grace.

AGE 45. OCCUPATION. House-wife.

ADMITTED. Ward 32, 8.12.29. transferred to Ward 14 on 16.12.29.

COMPLAINT. For the past 7 years the patient has been troubled with severe heartburn, a burning pain in the stomach passing right up to her throat, and waterbrash.

Two months ago patient had an attack of severe pain which doubled her up and shot through to the back. She had no vomiting.

Seven days before her admission to the Ward 32 she had a second similar attack of severe abdominal pain.

Patient has had no jaundice.

ON EXAMINATION. TEETH. All artificial. Own removed 10 years ago.

TONSILS. Patient gave no history of throat trouble. Both the tonsils were normal looking.

ABDOMEN. Gall-bladder area showed tenderness.

CHOLECYSTOGRAM. Examination suggests a pathological gall-bladder.

OPERATION. 17.12.29. Professor Wilkie.
The gall-bladder was thickened, congested, tense and full of stones. There was a fairly large stone impacted in the cystic duct. All other organs normal.
Cholecystectomy was performed.

SECTION OF THE GALL-BLADDER. Showed chronic inflammatory changes. The cystic gland gave a growth of B. coli.

TONSIL PUNCTURE. 17.12.29. was performed in the usual manner. On the blood plates B. coli and a streptococcus was obtained. These could not be separated and hence no animal inoculations were done.

ANTHONY

Case No: 11.

NAME. TAYLOR, Mrs Agnes.

AGE. 48. OCCUPATION. House-wife.

ADMITTED. 19.12.29.

COMPLAINT. Pain in the epigastrium.

HISTORY. Patient's first attack came on 12 months ago. It came on suddenly and was so severe as to double her up, and was accompanied by vomiting.
 Ever since these attacks have been troubling her now and again. Recently they have become very frequent. She says she noticed a change of colour during the attacks when she is inclined to be yellow.

ON EXAMINATION.

Teeth. Some stumps bad.
 Tonsils. Patient gave no history of throat trouble. Both her tonsils were normal.
 Abdomen. Definite tenderness on palpation in the gall-bladder area.

CHOLECYSTOGRAM. Ill-defined gall-bladder shadow..

OPERATION. 24.12.29. Prof. Wilkie.
 The gall-bladder was found to be definitely thickened and opaque and to contain calculi. The duodenum and stomach were normal.
 Cholecystectomy was performed.

GALL-BLADDER SECTION: shows chronic inflammatory changes.
 No growth of organisms was obtained from the gall-bladder wall or the cystic lymph gland.

TONSIL PUNCTURE. 24.12.29. was performed in the usual manner. S. mitis was obtained.

ANIMAL INOCULATION./

ANIMAL INOCULATION.

RABBIT NO: 63,64 were inoculated as follows:-

31.12.29.	2.0.c.c.	of the suspension of organisms		
				in saline.
7. 1.30.	3.0.c.c.	"	"	"
15. 1.30.	4.0.c.c.	"	"	"
21. 1.30.	4.0.c.c.	"	"	"
28. 1.30.	5.0.c.c.	"	"	"
4. 2.30.	5.0.c.c.	"	"	"
11. 2.30.	5.0.c.c.	"	"	"
17. 2.30.	5.0.c.c.	"	"	"
25. 2.30.	5.0.c.c.	"	"	"

In all 9 injections were given. The animal lost weight and were killed with chloroform.

3.3.30. Post mortem examination was done.
All the viscera were normal in both the rabbits.

RABBIT NO: 65. was inoculated as follows:-

31.12.29.	2.0.c.c.	of the suspension of organisms		
				in saline:
7. 1.30.	3.0.c.c.	"	"	"
15. 1.30.	4.0.c.c.	"	"	"
21. 1.30.	4.0.c.c.	"	"	"
28. 1.30.	5.0.c.c.	"	"	"
4. 2.30.	5.0.c.c.	"	"	"

In all 6 injections were given. The animal died.

5.2.30. Post mortem examination was done.
All the viscera were found to be normal.

SUMMARY. A case of definite cholecystitis.
The tonsillar organisms when injected into 3 rabbits failed to produce lesions of the gall-bladder.

Case No: 12.

NAME. GORDON, Mrs. Jessie.
AGE. 34. OCCUPATION. Housewife.
ADMITTED. 29.12.29.
COMPLAINT. Pain in right upper abdomen, flatulence, headache.

HISTORY. Patient was first troubled with pain about 15 months ago. It used to come on 2-3 hours after a meal. It was usually gnawing in character with occasional sharp stabs and was situated on the right side just below the ribs. It had a tendency to shoot upwards towards the right breast and occasionally round to the back on the other side. Greasy foods tend to bring on the pain and white medicine from the doctor and whiskey seems to do good.
 For about a year patient has been greatly troubled with flatulence and a feeling of distention after meals.
 Patient has never been jaundiced.

ON EXAMINATION.

TEETH. Fair.

TONSILS. When the patient was a child she remembered to have had some trouble with her tonsils, but not now. Both her tonsils were normal looking.

ABDOMEN. Nil to note.

CHOLECYSTOGRAM. Large gall-bladder faintly outlined alongside the spinal column.

OPERATION. 3.1.30. Professor Wilkie.
 The wall of the gall-bladder was slightly opaque and showed a little mottling suggestive of mild cholesterosis. The cystic gland was not enlarged.
 Stomach and duodenum were normal.
 Appendix was thickened in its distal half and was therefore removed.

SECTION OF THE GALL-BLADDER showed early cholestrolosis

No growth of organisms from the cystic lymph gland or the gall-bladder wall.

TONSIL PUNCTURE. 3.1.30 was performed in the usual way. No growth of organism occurred.

Case No: 13.

NAME. DUFFY. Mrs. Sarah.

AGE. 51. OCCUPATION. House work.

ADMITTED. 4. 1.30.

COMPLAINT. Pain in stomach below breast.

HISTORY.

Two years ago patient was operated on in Ward 15 for gall-stones. The gall-bladder was drained but not removed. Patient has had digestive trouble now and again ever since.

Patient was admitted to Ward 14 as an emergency. She complained of having had an attack of very severe pain which doubled her up and went from the front through to the back.

ON EXAMINATION.

TEETH. All artificial.

TONSILS. Patient gave no history of throat trouble. Both the tonsils were normal looking.

ABDOMEN. Nil to note.

CHOLECYSTOGRAM. Not done.

OPERATION. 7. 1.30. Professor Wilkie.

The gall-bladder was shrivelled, small and thick-walled with a large stone within it. The stomach and duodenum were normal.

Recurrent cholecystitis. Cholecystectomy was performed.

GALL-BLADDER SECTION. showed chronic inflammatory changes.

No growth of organisms was obtained from the gall-bladder wall or the cystic lymph gland.

TONSIL PUNCTURE. /

TONSIL PUNCTURE. 7. 1.30. was performed in the usual manner. *S. mitis* was obtained in a pure growth.

ANIMAL INOCULATION.

RABBITS NO: 66, 67, 68. were inoculated as follows:-

16.	1.30.	2.0.	c.c.	of the suspension of organism		
				in saline.		
21.	1.30.	3.0.	c.c.	"	"	"
28.	1.30.	3.0.	c.c.	"	"	"
4.	2.30.	4.0.	c.c.	"	"	"
11.	2.30.	4.0.	c.c.	"	"	"
17.	2.30.	5.0.	c.c.	"	"	"
25.	2.30.	5.0.	c.c.	"	"	"

In all 7 injections were given. The animals lost slightly in weight. All of them were killed with chloroform.

3. 3.30. Postmortem examination was done. All the viscera in the 3 rabbits were normal. Sections of the gall-bladder showed no changes in the wall of that organ.

SUMMARY.

A definite case of chronic cholecystitis, the tonsillar organism when injected into 3 rabbits failed to produce any lesions whatsoever.

Case No: 14.

NAME. WATSON. Mrs. Daisy.
AGE. 36. OCCUPATION. House wife.
ADMITTED. Ward 31. 5.1.30. transferred to Ward
 14. on 19. 1.30.
COMPLAINT. Epigastric pain.

HISTORY.

Patient began to be troubled with epigastric pain $7\frac{1}{2}$ years ago. The pain was sharp and was relieved by bringing up wind. It came on 1-1 $\frac{1}{2}$ hours after taking meals and was worst when the stomach was empty.

Patient has had a great deal of flatulence and heartburn but no vomiting and no jaundice.

$4\frac{1}{2}$ years ago patient had haematemesis and was operated upon when a gastro-enterostomy was performed. For two years afterwards she was alright but now she is as bad as ever.

During the last spring patient was much troubled with heartburn, sourness, and heaviness coming on after meals.

ON EXAMINATION.

TEETH. All artificial. Her own re-
 $4\frac{1}{2}$ years ago.

TONSILS. Perfectly normal in appearance. No history of throat trouble.

ABDOMEN. Obese. Tenderness in the right half of the upper abdomen. Nil to note.

CHOLECYSTOGRAM. Examination suggests a pathological gall-bladder.

OPERATION. 21. 1.30. Professor Wilkie.

The gall-bladder wall was thickened and laden with fat. It contained thick muddy bile and a single stone.

The stomach and duodenum showed no recent evidence of disease.

The appendix was tacked down and removed.

Gall-bladder/

Gall-bladder section showed chronic cholecystitis. No growth of organisms obtained.

TONSIL PUNCTURE. 21. 1.30.

No growth of organisms occurred.